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HEAPS OF ROCK PHOSPHATE MINED AT CLARENDON, OTAGO.

The

Journal of Agriculture.

WELLINGTON, NEW ZEALAND.

21ST JUNE, 1915.

ROCK PHOSPHATE IN NEW ZEALAND:*

ITS VALUE TO THE DOMINION.

B. C. ASTON, F.I.C.

THE presence of phosphates in the soil is essential to the growth of all crops, particularly root crops such as turnips, mangels, and potatoes. Many of the soils of this country, especially those of the North, are deficient in phosphoric acid in amounts necessary for successful turnip-growing, and readily respond to an application of 2 cwt. to 3 cwt. of a phosphatic manure such as Island phosphate, bones, or superphosphate.

The following results show the value of phosphate fertilizers in the growth of turnips at the Moumahaki Experimental Farm :—

	Tons	cwt.	qr.	lb.
Average crop per acre for nine years (no manure) ..	3	8	3	12
Average crop per acre for three years (2½ cwt. Malden Island phosphate)	26	0	1	24

* It is extremely desirable that the term "guano" should be restricted to the genuine article. Its use as a synonym of rock phosphate or phosphate containing little or no organic matter is misleading and should be discouraged.

Cost of fertilizer, 12s. 8d. per acre. Malden Island phosphate contains from 60 to 72 per cent. of tricalcic phosphate (bone phosphate), but no nitrogen or potash.

In 1899 a mixture of 1 cwt. of steamed bonedust and 2 cwt. of basic slag—an almost exclusively phosphatic fertilizer—gave a crop of 43 tons of turnips to the acre.

Taking another root crop—Sutton's Prizewinner mangels—at Moumahaki in 1904:—

	Tons.
No manure	50
Superphosphate, 3 cwt. (110 lb. $Ca_3(PO_4)_2$)	70, at 17s. 3d. per acre.
New Zealand ground rock phosphate, 4 cwt. (224 lb. $Ca_3(PO_4)_2$)	70, at 14s. per acre.

Our locally produced phosphate, which in this case was of low grade (50 per cent.), with no other treatment save drying and grinding, therefore gave as good a result as superphosphate, and was 3s. 3d. per acre cheaper.

To show the need the Dominion as a whole has for phosphates the following imports for 1905 and 1914 are quoted (see Year-book, p. 319, and *Journal of Agriculture*, November, 1914, p. 356):—

	1905.		1914.	
	Tons.	Value.	Tons.	Value.
		£		£
Bonedust	11,088	58,208	6,578	41,870
Island phosphate	5,523	15,204	22,093	56,169
Unenumerated (mostly phosphatic)	22,071	74,583	..	..
Basic slag	..	..	30,350	97,589
Superphosphate	..	..	41,582	151,780
Bone char	..	..	665	2,219
Phosphate n.o.e.	..	..	540	1,843

Upon the growth of turnips greatly depends the country's capacity for fattening stock. The demand for phosphate is therefore likely to increase as new lands are opened for settlement and as settlers become versed in the application of fertilizers and better able to afford the necessary outlay.

The illustrations supplement the figures given above. They are photos of the experimental plots carried out by the Manager at the Moumahaki Experimental Farm.

OCCURRENCE IN NEW ZEALAND.

The greatest store of phosphate is that which occurs in the soil. Some idea of the aggregate amount distributed through the great mass of soil may be obtained by assuming that the weight of an

RESULTS OF MANURING SWEDE TURNIPS WITH PHOSPHATES AT MOUMAHAKI EXPERIMENTAL FARM, INDICATING THE GREAT NEED THAT TURNIPS HAVE FOR PHOSPHATES.

No. 29 (left hand) manured with 2 cwt. superphosphate, ½ cwt. ammonium sulphate, ½ cwt. potassium sulphate, per acre. Yield per acre, 34½ tons. No. 28 (middle): No manure. Yield per acre, 1¾ tons. No. 27 (right hand) manured with 2 cwt. prepared guano per acre, containing 31 per cent. of tricalcic phosphate, 25 per cent. of insoluble nitrogen, and 2 per cent. of potash. Yield per acre, 27¾ tons.

acre of average soil, containing, say, 0·075 per cent. of phosphoric acid, to a depth of 9 in., is 2,000,000 lb. Then there will be well within the reach of plants in this acre 1,500 lb. of phosphoric acid, which is equivalent to nearly 3 tons of phosphate rock (of 50 per cent. phosphate-content). Most of the soil phosphate is not immediately available as a plant-food, but it should be the aim of good farming to make it available.*

In addition to being distributed in small amounts in nearly all rocks and in every soil which will grow plants, phosphates occur in masses of approximately pure mineral.

Calcium phosphate (phosphate of lime) is the most valuable of the natural mineral phosphates for manurial purposes. It is from this that superphosphate and many of the proprietary fertilizers used in New Zealand derive the phosphate to which they owe their chief value.

The occurrence of two instances in which tricalcic phosphate was found may be noted. The late Mr. Skey, Colonial Analyst, reported in 1885 on a specimen containing 20·78 per cent. of phosphoric acid (equal to 45·36 per cent. of tricalcic phosphate), forwarded by Mr. Fifield from Wangapeka, Nelson. In 1887 Mr. Skey reported on a coprolitic nodule from within a quarter of a mile of Weka Pass, discovered by Mr. McKay. This contained 17·45 per cent. phosphoric acid, equal to 38·09 per cent. tricalcic phosphate.

The only deposit which is worked in this Dominion is that at Horse-shoe Bush Estate, Clarendon, Otago, which was originally discovered by the late Mr. Ralph Ewing, of Dunedin. That this discovery was the result of systematic search by Mr. Ewing adds to the lustre of the discovery. Shortly afterwards phosphate was discovered at the Milburn Limestone Quarries, where boulders of it had long lain exposed to the full view of visitors (lay and scientific) to the quarry, and yet for twenty years or more the phosphate had remained undiscovered. Let no one, therefore, hesitate to send in for analysis specimens of rock having the hardness and texture of rock phosphate because of its familiarity or abundance. Trained geologists had, without doubt, seen and probably cursorily examined the Milburn and Clarendon phosphates without suspecting their true composition. In this connection it may be noted that the mineralogical name for the

* How this may be done, with details of the average phosphate-content of New Zealand soils, and further information on the economic aspect of phosphate, may be found in the author's Bulletin No. 48 (new series), or in this *Journal* for July and August, 1913 ("Phosphates: Their Importance to the New Zealand Farmer").

crystalline phosphate of lime is "apatite" (from the Greek "apatao," to deceive), a name which must commend itself to those who did not discover the deposit. Indeed, the discovery of great phosphate-fields has more than once been the result of an accident. For some time a large piece of rock brought from a Pacific island

RESULT OF MANURING SWEDE TURNIPS WITH POTASH AND NITROGEN.

To be studied in conjunction with illustration on page 497.

The centre two drills received ½ cwt. of potassium sulphate and ½ cwt. of ammonium sulphate per acre (containing two of the essential plant-foods), yielding 1¾ tons per acre. The superior growth on either side is due to phosphatic manuring, 1 cwt. to 2 cwt. of basic slag on one side and 2 cwt. of superphosphate on the other, producing a 30-ton crop.

was used to hold a door open in an Australian city office. One day it attracted some one's notice, and was then found to be high-grade phosphate. This led to inquiry and resulted in the discovery of a rich phosphate island. The large Algerian deposits were discovered by the accidental curiosity of an observant foreman.

Some large soft deposits in northern France were for years used to dress roads until their phosphatic nature was discovered. Andrew narrates that a specimen of Milburn phosphate was submitted to an analyst for his opinion on its value as a source of quicklime. He condemned it as a poor sample, without discovering its true nature—a story which involves one of two negations: clearly it was either no phosphate or he no analyst. Andrew says, "The manner in which the phosphate escaped detection now seems marvellous. A specimen of the phosphate was to be seen in the Otago Museum, labelled 'Decomposed Limestone from Clarendon.'" Lastly, there is the classic instance of the Cambridgeshire coprolites, which were used to metal roads, and were discovered by Henslow in 1854, attention having, it is said, been directed to the fertilizing action of the road-dust on the adjacent paddocks.

It will be seen, therefore, that it is easy for a person to pass over phosphate through failing to take sufficient notice, and it is to accustom farmers and others to the appearance of the mineral that small samples have been distributed gratuitously by the Department for the last ten years, a policy which I have no doubt is appreciated and of which I cordially approve. Issued with the information which is to be found under the heading "External Characters of Phosphate, and Tests," samples of rock phosphate may greatly assist prospectors in conjuring up an idea of this valuable rock's appearance.

Isolated boulders and fragments of calcium phosphate have been from time to time recorded from districts other than Clarendon. None of these has as yet proved to be of more than theoretical interest. It may be as well to enumerate these instances in the hope that possibly a closer search may reveal larger deposits.

The most promising of these finds was that at Whangarei. Major G. Clark-Walker, in November, 1906, forwarded me a sample of white phosphate rock which was almost pure phosphate of lime, containing 87 per cent. Inspector Stone, of Whangarei, about the same time sent in a specimen which contained 77 per cent. The higher-grade specimen was so like the Clarendon phosphate in appearance that I thought a mistake had been made, but I was assured that this was not so by Major Clark-Walker, who was corroborated by Inspector Stone. Referring to the high-grade specimen and the place where it was discovered, the former gentleman writes, under date 5th November, 1906, "I find that it was a piece of what looked like shell, out of a lump of rock from a pit (out of which stone had been taken for the road) at a place called Tikarangi, between the Mata Hill, past Mangapai and Wha-

ngarei, at the foot of the road known as the Grouse Neck. I tried the shell, and it dissolved in nitric acid altogether and gave a rich creamy-yellow deposit with an aqueous solution of ammonium molybdate." Major Clark-Walker must be congratulated on being the first to prove the presence of rock phosphate at Whangarei.

I afterwards, in the same year, visited Whangarei, making a careful examination of the locality for exposed phosphate with Major Clark-Walker, with a negative result.

In the same month Captain J. Sinclair, Harbourmaster at Port Robinson, Cheviot, Canterbury, forwarded a bag of greenish-looking specimens which he stated appeared as a layer on top of the limestone. These contained 35 per cent. of tricalcic phosphate.

In January, 1907, Mr. H. R. Holman, of Kamo, Whangarei, sent me a large greyish-white boulder, differing in appearance from anything previously found in New Zealand, and containing 62·3 per cent. of phosphate of lime.

In February, 1907, Messrs. J. Harrison and Sons, Whangarei, sent me a piece of phosphate rock found in that district, which contained 50·73 per cent. phosphate of lime.

In June, 1909, Mr. J. S. Wilson sent me from the limestone rocks at Hikurangi, near Whangarei, a specimen containing 58·35 per cent. phosphate of lime and much carbonate; and in July of the same year Mr. A. F. Buckland sent a piece of phosphate from Fairfield, Oamaru, containing 37·9 per cent. of phosphate of lime.

The bonus offered by the Government in 1906 for the discovery of phosphates resulted in the receipt in 1907 of 539 specimens of various rocks, most of which were proved by analysis to be of no value. The following year many more specimens were tested, with similar results. In 1909 the interest in the subject continued, 107 specimens being sent in for analysis, the following being of interest:—

K2407, a shelly conglomerate, containing teeth and fossil bones, forwarded by Mr. J. T. Armitage, Ponsonby, Auckland, contained 4·48 per cent. of phosphoric acid.

K2159 was a phosphate rock from Mr. T. Mitchell, Whakapara, Hokianga, but the sample was too small for quantitative analysis. Further samples of rocks from the same correspondent revealed no trace of phosphate.

K1560 was a phosphate rock of high grade said to have been found in the Waimate district, and forwarded by Mr. George Pitcaithly, of the District High School. Only a small piece was received, and nothing further has been heard of the matter.

A most interesting discovery was made by me at the Antipodes Islands (the nearest land to the antipodes of Greenwich, lat. 49° 42′ S., long. 178° 43′ E.). These are a few tussock-covered islands (12,960 acres) belonging to New Zealand, and leased to Captain Tucker, of Gisborne; lying about 458 miles in a south-easterly direction from Port Chalmers. The rocks on the islands are purely volcanic. Large beds of ashes and ferruginous scoria abound, the cliffs under which we anchored being apparently built up of beds of scoria, successively deposited, giving the cliff the appearance of a sedimentary rock.

The analyses of the red scoria (K3001), basalt (K3002), and red earth (K2675) derived from the red scoria, are given below. The rocks contain an abnormal proportion of phosphoric acid, while the red earth contains about 30 per cent. of phosphates, 8·4 per cent. of which is titanium phosphate. This resisted the action of six successive fusings with bisulphate of potash. It is thus in this state probably one of the most refractory phosphates known.

ANALYSES.

Antipodes Islands Deposits.

	K3001. Red Scoria.	K2675. Red Earth.	K3002. Basalt.
Silica (SiO_2)	41·95	27·68	43·15
Alumina	13·40	10·48	15·45
Ferrous and ferric oxides	15·75	27·40	14·85
Phosphoric anhydride (P_2O_5)	2·55	10·70	1·08
Lime (CaO)	9·10	1·50	8·80
Magnesia (MgO)	5·58	0·79	7·10
Manganese oxide (Mn_2O_3)	0·25	Trace.	0·13
Titanium oxide (TiO_2)	2·25	0·46	3·44
Sodium oxide (Na_2O)	7·74	2·25	4·10
Potassium oxide (K_2O)	1·56	0·60	1·25
Moisture at 110°	0·36	4·35	1·13
Loss on ignition	..	5·00	..
Titanium phosphate (insoluble)	..	8·40	..
Zirconium oxide	..	0·41	..

The matter insoluble, after treating with HCl and HNO_3, was evaporated to dryness, treated with HF and H_2SO_4, dissolved in HCl, and fused with $KHSO_4$. It then equalled 8·4 per cent., and was found to consist of titanium phosphate. I brought the matter under the notice of Mr. A. Hutchinson, of Pembroke College, Cambridge, the well-known mineralogist, and he is at present investigating the mineralogical aspect of this curious occurrence.

The possibility of titanium phosphate being formed during the progress of the assay must be remembered, but the large amount of phosphoric acid in these rocks is unusual and difficult to account for.

Bounty Islands Granite.

	K2996A. Exterior polished by Sea-birds.	K2996. Interior.
Loss on ignition	5·00	1·15
Silica	48·25	66·95
Lime	9·70	3·25
Alumina	13·30	12·50
Ferric oxide	4·14	4·60
Phosphoric anhydride*	11·77	1·90
Magnesic oxide	0·83	0·43
Titanic oxide	0·35	0·60
Potassic oxide	2·76	4·18
Sodic oxide	4·42	4·60
	100·52	100·16
*Equal to tricalcic phosphate	25·69	4·14

Iron phosphate, called by mineralogists "vivianite," has been recorded from many localities, including Campbell Island, North-east Valley, Dunedin, Timaru, Pohangina River, Port Chalmers, Taranaki, Thames, Mercer, and Huntly (Waikato). It is easily distinguished by its fine blue colour. Crystals of vivianite have been found in moa-bones.

Aluminium phosphate is said to occur on Green Island, off the coast at St. Clair, near Dunedin. Both iron and aluminium phosphates are of doubtful value as fertilizers on ordinary land.

WHERE TO LOOK FOR PHOSPHATES.

The deposits at Clarendon occur in limestone pockets. Search should therefore be made in those districts where limestone occurs, either as pure compact limestone or as calcareous sandstone. Deposits of coprolites, or phosphatic nodules, having a corrugated surface, and being often black in colour, may be looked for in greensands. I have specimens of these coprolites from Oamaru and from Flagstaff Hill near Dunedin.

EXTERNAL CHARACTER OF PHOSPHATES, AND TESTS.

New Zealand mineral phosphate, which has hitherto been found in workable quantities only at Milburn and Clarendon, Otago, has a dirty yellowish-white or light-grey colour. Some specimens exhibit a decided pink tinge in patches. It is usually amorphous (non-crystalline), but thin veins of crystalline apatite have been

found at Clarendon, and there is no reason why large quantities of crystalline phosphate should not be found. In general aspect Otago phosphate resembles the harder amorphous limestones (lithographic limestone), but may easily be distinguished by not effervescing to any extent when brought into contact with a drop of dilute hydrochloric (muriatic), sulphuric (vitriol), or nitric (aqua fortis) acid. It is, moreover, harder and heavier than any limestone, but it is quite possible that soft specimens may be found. It is softer than feldspar and than most silicate rocks likely to be mistaken for phosphate. Some specimens have a tendency to exfoliate or shed their fragments in layers when struck with a hammer. To sum up:—

(1.) Phosphate of lime has almost any colour—usually whitish, yellowish, greyish, greenish, pink, or black.
(2.) Hardness: Usually softer than feldspar or than quartz, but harder than limestone.
(3.) Specific gravity: Heavier than limestone or quartz.
(4.) Usually non-crystalline, but may be crystalline.
(5.) Does not perceptibly effervesce with acid.

A good test that may be applied by those who have the necessary materials is to grind the rock to a fine powder, and place about as much as will lie on a threepenny-bit, with about ½ in. of magnesium ribbon, in a glass tube which has been drawn out and closed at one end in the flame. The tube is then heated to redness over a lamp or candle or with a mouth-blowpipe until the magnesium kindles, and then plunged into cold water. If any phosphate is present in quantity, a few bubbles of gas, consisting of hydrides of phosphorus, will be formed, and will communicate to the water and air a putrid metallic smell, which is most characteristic, and recalls the odour of decaying fish. A similar smell may often be noticed near an acetylene-generating plant.

The following chemical test for phosphate may be practised by those who have any knowledge of chemical manipulation:—

A suspected rock is ground finely in a mortar and pounder, and dissolved in nitric acid in a glass vessel with the aid of heat. The solution is then filtered, and the molybdate solution, made as directed below, is added. On standing in a warm place at a temperature not exceeding 70° C. a dense yellow precipitate separates out if any phosphate is present.

Another very good test, perhaps the best, is to put a few drops of the molybdate solution (which any druggist will make up) on the suspected phosphate. A brisk effervescence indicates that the rock is a carbonate, probably carbonate of lime; no

QUARRYING ROCK PHOSPHATE AT MILBURN, OTAGO.

In the extreme top left-hand corner of the picture may be seen an outcrop of phosphate rock—black above, white below.

reaction, that it is a siliceous insoluble rock such as basalt, quartz, or greywacke. If in a minute or two a yellow colour appears where the solution rests, the rock is probably phosphatic.

If a rock answering to the above description and tests be found, a small specimen should in the first instance be sent per sample-post, addressed to the Chemist, Department of Agriculture, Sydney Street, Wellington, by whom it will be tested and reported on free of charge.

Reagents for the Molybdate Method.—Molybdic Solution.

Prepared by dissolving 100 grams of finely powdered molybdic acid with heat in 400 grams of 8-per-cent. ammonia of 0·967 specific gravity, and pouring the solution into 1,500 grams of nitric acid of 1·2 specific gravity; or else by dissolving 150 grams ammonium molybdate in one litre of hot water, and pouring the solution into one litre of nitric acid of 1·2 specific gravity. Prepared in this way the molybdic solution will contain in the former case 5 per cent., in the latter case from 5 to 6 per cent., of molybdic acid, and 100 cubic centimetres of it are required for precipitating one-tenth gram of phosphorus pentoxide.

MANUFACTURE.

The processes involved in converting the phosphate as quarried into a marketable article are: (1) Grading according to quality; (2) drying to expel the moisture (this is done by placing the selected rock upon bundles of faggots or logs of wood, which are then ignited); (3) grinding to a fine powder.

The product is now ready for the market, and may be used for many soils in this state. For some soils, however, it is best converted into superphosphate by the action of sulphuric acid (vitriol), in which form it is soluble in water and makes a valuable fertilizer.

For soils or crops that require nitrogen or potash these ingredients may be added either to the ground rock or the superphosphate.

It is thus seen that the industry is one of the simplest to work successfully and employs a very large proportion of unskilled labour.

NEW ZEALAND PHOSPHATE ROCK.

Professor Park, in the "Transactions of the New Zealand Institute," Vol. xxxv, p. 397, thus describes the rock phosphates of Otago:—

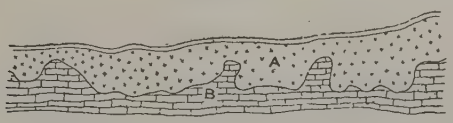
"This was first found at Discovery Point, at the head of the bend, where it rests on the upper surface of the limestone. Here it forms a massive outcrop, from 12 ft. to 18 ft. high and from

4 to 5 chains long. It consists of a very dense grey or yellowish-grey rock phosphate, very rich in calcium phosphates. In places it is nearly pure phosphorite, occurring in narrow-banded pale-yellow and grey concretionary masses, possessing a tendency to exfoliate in layers when struck with a hammer. Cavities in this rock were found to be encrusted with apatite possessing a mammillary structure. The extent of the deposit at this place has not yet been determined.

"Another outcrop of rock phosphate crops out on the side of a valley opposite Discovery Point, and near it several large masses of this mineral occur in a small depression in the hill about 20 ft. above this outcrop. Recent excavations show that the phosphate-deposit here is of considerable extent. It has been exposed by open trenches for a distance of 4 chains along the side of the hill, and is found to rest on an eroded surface of the greensands. Loose masses of rock phosphate lying on the slopes to the north of this point to the presence of another deposit in that direction.

"At Kiln Point a considerable amount of stripping and trenching has been effected, and here much interesting information was obtained concerning the mode of occurrence of the rock phosphate. At this place the outcrop has been stripped for a distance of nearly 2 chains, exposing a very clear vertical section of the phosphate-deposit and underlying limestone. The phosphate varies from 3 ft. to 12 ft. in thickness, and rests in a series of pockets in a deeply eroded surface of the limestone. In the face behind the old limekiln there are three shallow pockets, the most southerly being 45 ft. wide, the second 18 ft., and the third about 22 ft., varying in depth from 2 ft. to 6 ft. The pockets are separated from each other by ridges of limestone, averaging 3 ft. or 4 ft. wide, as shown in the following diagram:—

SECTION I.



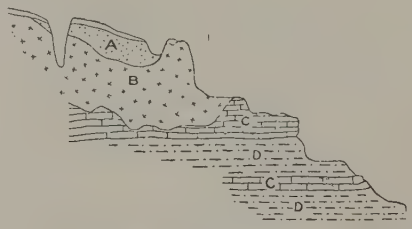
KILN POINT: FACE EXPOSED BEHIND OLD KILN. A. PHOSPHATE ROCK. B. LIMESTONE.

"The phosphate fills the pockets and rises above the level of the dividing ridge of limestone to a height varying from 3 ft. to 10 ft., the greatest depth occurring at the north-east end of the section.

"The phosphate rock exposed in the face of the open cutting is much broken and crushed, and sometimes shows slickenside surfaces. It is yellowish-brown in colour, with irregular seams and patches of whitish-grey. The presence of sand renders it soft and friable and of lower grade than that exposed at Discovery Point.

"At the most easterly point of the open cut, masses of fairly pure phosphate rock contain inclusions of basalt, occurring in small angular or nodular fragments, which are seldom over 4 in. in diameter. In a deep, narrow trench above the open cutting the phosphate is mixed with glauconitic greensands, which are said to be highly phosphatic.

SECTION II.

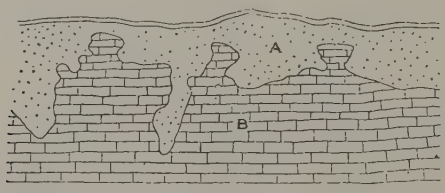


KILN POINT. A. PHOSPHATIC GREENSANDS. B. PHOSPHATE ROCK. C. LIMESTONE. D. GLAUCONITE GREENSANDS.

"The rock phosphate has been exposed by a long trench some 12 chains north of Kiln Point, but no feature of special interest is disclosed in this direction.

"At Milburn Lime-quarry the surface of the Eocene limestone presents the most marked irregularity. Under the influence of both chemical and physical erosion it has been formed into wide basins and deep well-like holes, surmounted by overhanging knobs and spires of limestone. The basins are filled with yellowish-brown sands, as shown in Section III, below:—

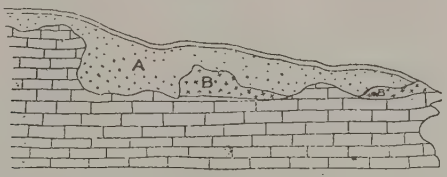
SECTION III.



MILBURN QUARRY, SHOWING SURFACE OF LIMESTONE IN PRESENT WORKING-FACE. A. BROWN SANDS. B. LIMESTONE.

"On the right side of the present quarry-face the upper horizon of limestone has been eroded down to the lower, more sandy, and glauconitic horizon, on the irregular surface of which there rest two small patches of rock phosphate, as shown in Section IV.

SECTION IV.



MILBURN QUARRY, SHOWING TWO PATCHES OF PHOSPHATE ROCK RESTING ON LOWER HORIZON OF LIMESTONE.

"On the right bank of a small stream near Sutherland's limestone quarry there is a high face of rock phosphate resting in a basin in the lower horizon of limestone, and a few hundred yards south-west of Milburn Quarry there is a similar, but smaller, outcrop, which also appears to lie on the higher part of the lower horizon. The surface contours and the presence of basalt fragments in the phosphates at Kiln Point tend to show that the formation of the deposits took place in comparatively recent times—probably in the Post-Pliocene period—and obviously since the present contours of the district were determined. Hence it seems probable that the phosphate-deposits will be marginal and follow the line of limestone outcrop, contouring around the slopes of the hills bounding the valleys and shallow basins."

Professor Park adds:—

"The evidence available from a surface examination shows that a large quantity of phosphate rock exists in this district, but until the deposits have been fully developed by trenching it would be obviously impossible to express the tonnage numerically. The discovery will doubtless be followed by other discoveries in different parts of the colony in districts where similar geological conditions exist, the most likely localities being in Southland, North and South Otago, North and South Canterbury, Marlborough, Raglan, and North Auckland districts."

Dairying.—California now has nine cow-testing associations, the largest of which is the Ferndale Cow-testing Association. More than four thousand cows are on its list, and it is the largest association in the world.—*Pacific Rural Press.*

A PRACTICAL TALK ON SPRAYING.

A. BAILEY MANSFIELD.

As a good many growers express dissatisfaction as to the different results they obtain from the various spraying-materials, and as the spraying season is now at hand, it is opportune to look into the methods employed. All the sprays are not miracle-workers, and growers require to use their judgment and experience in deciding the exact proportions to use, varying them, of course, in accordance with the conditions prevailing.

In early spring some of the sucking insects are rather more difficult to kill than later in summer and require a proportionally stronger solution. This may probably be due to the fact that nature provides that they should be hardier in early spring to be able to withstand the cold nights. Sucking insects, which comprise the scales, mites, and red spiders (*Bryobia*) and aphides, should be killed by contact sprays or washes. For applying such sprays a fine nozzle should be selected, and the material should be sprayed on at a pressure of at least 100 lb. to the inch.

This can be obtained by several manual pumps that are on the market. For my own part, I consider that every grower who has 10 acres or upwards should possess a motor-power sprayer. With such a machine a pressure of very high driving-power may be maintained at a minimum of expense. They certainly make for efficiency in spraying. The high pressure is necessary owing to the fact that nearly all insects have some kind of natural protection, and a coarse spray washes off without wetting or penetrating their protective covering. This is especially so in the case of woolly aphis and red spider. These two types require at least two sprayings to effectually deal with them. Generally speaking, sprays should be used a little stronger in wet weather than in fine. The foliage is more likely to be scorched by spraying under a blazing sun than during wet, cool, or damp weather. Hard water requires a little more of the spray material per 100 gallons than soft water, and in the use of any of the miscible oils the water, if at all questionable, should be softened by the addition of washing-soda or potash, otherwise there will be great difficulty experienced in the making of a perfect emulsion. Never spray trees whilst in bloom, as it almost always tends to affect the

setting of the fruit. It is best done either before the blossoms open or after the fruit has set. Experience will guide the grower in this matter.

The inexperienced have the idea that one spraying at one strength should be a certain cure for all diseases and pests. It cannot be too strongly urged that, to be thoroughly successful, spraying needs to be done intelligently, taking into consideration the conditions prevailing and the disease or insects which are to be attacked. Never be persuaded that parasites will do the work for you. Never use sprays that you know nothing about. Use care and discrimination in the weighing-out of materials and apportioning the quantities. Spray on the lines directed as above, and in making the applications always have in mind the results that you wish to obtain.

NECTARINES.

W. H. TAYLOR.

THERE appears to be a considerable demand for late nectarines, due probably to the fact that peaches obtainable at that time are mostly poor in quality, and nectarines also are becoming scarce. Late nectarines are a somewhat uncertain crop. If rainfall is plentiful near the time of ripening they are liable to crack. This appears to show that it would be unwise to plant many on low-lying or rich soil. Their place is on poorish soil on the high lands, where it might be expected the usual autumn rainfall would be just what they want. It is somewhat singular that one of the best nectarines is a very late one, perhaps the very latest. I refer to W. C. Tripp, a variety similar in appearance to Lord Napier, but much larger. It is as large, in fact, as a fairly good peach, being about equal in size with Armsden's June and Saunders. The quality is good, and it carries a good crop. At Arataki it ripened about the 15th March. Just before this variety is Jean de Padua, a quite remarkable fruit. The colour is rich orange, or nearer golden—an even colour all over. The fruit is rather small, but is rich in flavour. The tree is a good bearer. The first was ripe on the 1st March, and kept two weeks. A few days before this there was Victoria, a small and highly flavoured fruit of ordinary nectarine colour, and Byron, a variety of a distinct yellow colour, paler than Jean de Padua and darker than the variety known as New White. Any one desiring late nectarines would find the above quartet worth while.

LUCERNE, OR ALFALFA (MEDICAGO SATIVA).

W. J. McCULLOCH.

In introducing this article it may be well to quote a few of the questions asked by the farmers on this subject, viz.: Can lucerne be grown in my district? What is the approved method of establishing this much-talked-of fodder? What is inoculated soil, and is its use absolutely necessary to successfully establish lucerne? Can the crop be grazed with stock?

The Department of Agriculture has done much in recent years to develop interest in this valuable farm crop by distributing grátis to farmers seed, inoculated soil, and lime with a view of testing the capabilities of different soils in the Dominion for lucerne-production.

Lucerne is said to be one of the oldest forage plants in the world; its home being Asia, probably the south-western parts. In Persia it was cultivated more than two thousand years ago, where it was highly esteemed as a fodder for horses. From here it was introduced into Greece during the Persian wars, about 500 B.C., thence to Italy. It was also introduced into western Europe by way of northern Africa. The Moors carried the plant to Spain in the seventh century, whence it spread through France, and is now grown in all European countries except where the winter is too severe. The Spaniards carried it to Mexico during the time of the invasion; from there it spread over the greater part of South America, the United States, and Canada, where it is still known by the old Spanish name of "alfalfa." Some believed this name was derived from the Arabian "al-chelfa," which means "that which grows after something else," and is generally applied to plants which thrive after the spring growth has disappeared. This would probably signify the ability of lucerne to withstand the effects of a hot, dry summer and produce many crops in one season. In the fifteenth century Fray Pedro de Alcala, a prominent specialist in the Arabian language, identified the Spanish "alfalfa" with the Arabian "alfacfacah," which has been accepted as correct, and means "the best sort of fodder." An old Spanish name for the plant is "userdas" which is possibly identical with the name "louzerdo," used in southern France, but this point has never been

definitely decided. It may be that the European name "lucerne" comes from "lucerno," which is an old Provençal word.

From the foregoing it will be acknowleded that from ancient times lucerne has been considered a most valuable fodder plant, and to a certain extent one with very great adaptability for different climates and soils. It is very necessary that the latter qualification of adaptability should be modified, as climatic and soil conditions are both extremely important in successfully establishing lucerne.

There appears to be a fairly general opinion that this plant is only suited for hot, or at least warm, climates and mild winters with little or no frost. That such an opinion is not well founded is plainly proved by the fact that even in this Dominion it has long been grown successfully in portions of Central Otago where the summers are very warm but the winters often severe. In certain portions of Canada where the summers are hot and dry and the winters sometimes very severe—the thermometer frequently falling many degrees below zero—it is grown successfully. Lucerne will withstand extremes of climate fairly well provided it is grown on a deep, well-drained soil, with proper care and attention, but it quickly loses root and dies away on a waterlogged soil, even in a mild climate. Again, there are different varieties of lucerne each having its own peculiar characteristics—viz., resistance to drought or extremes of heat and cold, stooling-power, quick and prolific growth, adaptability for grazing, &c. While it must be admitted that certain conditions of soil and climate are much more favourable to the growth of this plant than others, the fact must be acknowledged that a large proportion of the agricultural lands in this Dominion are admirably suited for the profitable production of this fodder. Lucerne can be grown on many soils, from sand or sandy loams to clays. The root system is one of the striking features of this plant, for, given the favourable conditions of an open porous subsoil, they penetrate to enormous depths in a very short time. I have seen roots of eight-months-old lucerne in Central Otago dug up which measured slightly over 6 ft., and this without irrigation. It is therefore very important that the subsoil should be free and open, for it is this deep-rooting habit which makes lucerne so valuable, enabling the plant to withstand prolonged droughts which so seriously injure ordinary shallow-rooted plants such as white clover, &c., besides enabling the plant to obtain food substances from depths to which most other plants never gain access. Thus with this power to draw upon distant sources of plant-food it eventually fertilizes the surface soils at the expense of the subsoils. Also, when the roots

TEN-MONTHS ROOT OF LUCERNE IN PUMICE SOIL.

finally decay humus is added to the soil, and the small channels left by their decomposition greatly assist in the natural drainage and aeration of the soil and subsoil, a condition which is very beneficial to all land.

A most important matter in establishing lucerne is good drainage. No doubt much disappointment and failure has been caused by lack of this essential, for lucerne can never succeed where the top soil or subsoil is in a waterlogged condition, or where the permanent water-table is at a less depth than 5 ft. or 6 ft.

Should a pan of any sort exist, this must be first broken by subsoiling to allow the tap-roots free passage downwards, and this at the same time assists drainage. Where drainage is good, aeration of the soil should follow; in other words, by proper drainage the soil-moisture is not allowed to become stagnant, thus the air is permitted to permeate and sweeten the soil. This is a most important matter in growing lucerne.

This plant belongs to the family of pod-bearers (peas, beans, clovers, &c.) known as legumes, these having the power to absorb nitrogen from the air in the soil by means of the bacteria in the small nodules or wart-like knobs on their roots. Thus they collect nitrogen for the use of the plant as well as supply to the soil for future use by other plants a necessary food, and one which the farmer is content to purchase at a high price in artificial fertilizers.

Although lucerne thrives on many soils, provided drainage is good, the ideal soil would be a deep calcareous (lime) loam containing a good percentage of clay. River-flats often offer ideal conditions for its growth.

From the above it will be observed that should acidity exist in the soil, an alkali such as lime or basic slag must be applied to correct it. Application of the latter is recommended for sour soils on account of the phosphates it contains, as these latter greatly assist the growth of the young plants, besides which the lime-content neutralizes the acidity. Basic slag at the rate of 3 cwt. per acre should be applied from a month to six weeks before seeding, and where soil is thought to be deficient in potash, kainit at the rate of 1 cwt. per acre should be added with the seed.

Select land which has been under cultivation for a sufficient length of time to ensure its being free of weeds or weed-seeds, for if weeds infest the soil to any extent during the first season only failure can result. The better plan is to choose land in which potatoes, or other crops which had received intercultivation, had been grown, or summer-fallowed land. Prepare a fine tilth by plenty of disking and harrowing, heavily rolling before seeding.

LUCERNE HAY IN MARLBOROUGH.

Like other leguminous plants, lucerne depends for its vigorous development on the bacteria in the nodules of its roots, and as these bacteria are not present in all soils it is highly necessary that they be introduced if the resultant crop is to be healthy and vigorous. Soil from an old-established lucerne-field which contains these bacteria is for this purpose transported and sown broadcast, usually at the rate of from 200 lb. to 300 lb. per acre, previous to seeding. Inoculated soil should only be handled during dull weather. Immediately after application the land should be disked or harrowed, or both, so as to incorporate it into the soil as soon as possible, since direct rays of sunshine destroy bacterial life.

The varieties which have been found by experiments conducted in the South Island to give the best results are Marlborough, Hunter River, and Dryland. The Arabian, Peruvian, and Hungarian

varieties have the power of quick recovery after cutting, in the order named, but none of these latter have proved equal in yield to the former three.

In the majority of cases the acre tests recently carried out with lime and inoculated soil comprised land of a free open character, being chiefly terraces and river-flats. Lime and inoculated soil showed to advantage in nearly every district. It is a significant fact that where the directions of sowing in rows and giving intercultivation to keep down weeds were not adhered to the experiment inevitably ended in disaster.

CUTTING A FOUR-WEEKS GROWTH OF LUCERNE ON ADAMS BROS.' FARM.

In the majority of districts in the South Island the beginning of November has been found to be the best time to sow, but it may also be sown in autumn where the climate is not too rigorous and soil-conditions are suitable.

The seed should be drilled in in rows 1 in. to 1½ in. deep on the flat, and 14 in. apart, at the rate of 15 lb. per acre—if broadcasted, sow 20 lb. or 25 lb. per acre. Lucerne is often sown broadcast with good results, but this can only obtain under the most favourable conditions of climate and soil and in the absence of weeds. The great object in recommending sowing in rows is to enable intercultivation to be carried out during the first season, and so contend with

weeds. The young plants are delicate and only succeed where there is no competition, hence the necessity of the land being as clean as possible.

When the young plants have attained a height of from 6 in. to 10 in. the mower should be run over the crop, care being taken to leave a stubble of not less than 3 in., for it is most important that at no time during the life of lucerne should the crown of the plant be injured. The results of this cut should be left on the ground as a mulch. Lucerne in the seedling stage is single-stemmed, and the object of this cutting is to assist stooling. Should the crop throw up sufficient foliage for a further cut the first season, the proper time to cut henceforward is on the first appearance of the flowers or when one-tenth of the crop is in

THE SECOND CROP OF LUCERNE HAY FROM A TWENTY-YEAR-OLD STAND AT SUNNYSIDE MENTAL HOSPITAL, CHRISTCHURCH.

flower. The hay should be carefully handled, or much loss will result. It should be raked into small cocks and cured in this way. This tends to toughen it, thus preventing the leaves from breaking off, which is quite important when it is considered that much of the nourishment is in the leaf. Lucerne is also well adapted for making ensilage or for green-soiling purposes. It can be fed off by stock, but, like other leguminous crops, there is danger of cattle or sheep becoming blown if allowed too much at first.

Feeding off lucerne must be done with great care, and never the first season. It will probably be found best to feed it off in small breaks, the stock being shifted often.

Lucerne is essentially a hay, silage, or green-soiling plant, and this method of utilization is by far the most profitable.

After the crop is removed a stroke with light harrows is recommended as beneficial, merely to break any crust which may have formed on the surface.

Under favourable conditions and with care lucerne enjoys long life. In California fields that are upwards of fifty years old are reported to be yielding well. At Ashburton a patch of lucerne twelve years old was cut six times last season, and to all appearances was still quite robust and thick on the ground. A plot of Hunter River established at Sunnyside Mental Hospital, Christchurch, upwards of twenty years ago continues growing vigorously, giving four and five cuts annually. Up to the present this season it has yielded in two cuts 18 tons of green fodder, and is now ready for a further cutting.

At present no fodder plant is known which can compete with lucerne in nutritive value and general importance for feeding. Even red clover is inferior to it in nutritive value, the protein-content being smaller. Lucerne is relished by all farm animals. It is excellent for dairy cattle and for fattening all kinds of stock.

THE MARTON PLOTS.

G. DE S. BAYLIS.

As it was too late in the season for sowing cereal crops by the time the drainage scheme was completed, the Marton plots were sown in various kinds of kales, rape, chou moellier, and so forth, in order that the land might be clear of crop in autumn to enable a regular rotation scheme to be inaugurated. With this end in view a section of the land (N) has been left without further drainage and without lime; A, another block, has been drained and limed; B, another block, has been drained and limed, and is to have green manure ploughed under; C, another block, has been drained, limed, and subsoiled, and will also have green manure ploughed in.

Included in the above are further subsections, as, for instance, in block A certain small plots are without lime; another has received a dressing of papa; while in block B certain small plots will have two green crops ploughed under—viz., barley followed by oats, another rape followed by oats, a third mustard followed by oats, and a fourth vetches followed by oats. In block C there are subsections which have been subsoiled by a special implement, and at the same time a dressing of lime and fertilizer has been applied to the subsoiled area.

Owing to the dry season no results were sought or expected from the draining or liming of the land accomplished just previous to sowing the crop.

The crops which did best were those sown in wide drills, thus permitting of intercultivation.

Plot 15: Sown in Marrow Stem kale; 1 lb. of seed in 28 in. drills; thinned, hoed, and cultivated. Manure: 1 ton ground limestone per acre; 136 lb. superphosphate, 24 lb. sulphate of potash, 78 lb. bonemeal, 104 lb. dried blood, and 24 lb. sulphate of ammonia: total, 366 lb. Carried an equivalent of 2,622 sheep for 1 day, or 100 sheep for 26·2 days.

Plot 9: Sown in 14 in. drills with Perry's Thousand-headed kale. Manures: Limestone, 1 ton per acre; 91 lb. of superphosphate, 14 lb. sulphate of potash, 53 lb. bonemeal, 69 lb. dried blood, and 16 lb. sulphate of ammonia: total, 243 lb. Carried an equivalent of 1,419 sheep for 1 day, or 100 sheep for 14·19 days.

Plot 19: Buda kale, in 14 in. drills. Manures: 1 ton fine ground limestone; 105 lb. superphosphate, 15 lb. sulphate of potash, 60 lb. bonemeal, 78 lb. dried blood, 18 lb. sulphate of ammonia: total, 275 lb. Carried 1,548 lambs for 1 day, or 100 lambs for 15·4 days.

Plot 31: Essex Broadleaf rape, in 14 in. drills. Manure: 114 lb. superphosphate, 18 lb. sulphate of potash, 63 lb. bonemeal, 88 lb. dried blood, 25 lb. sulphate of ammonia: total, 308 lb. Carried 860 lambs for 1 day, or 100 lambs for 8·6 days.

Plot 17: Chou moellier; ¾ lb. seed in 28 in. drills. Manure: 1 ton fine-ground limestone per acre; 106 lb. superphosphate, 19 lb. sulphate of potash, 61 lb. bonemeal, 80 lb. dried blood, 19 lb. sulphate of ammonia: total, 285 lb. Carried at the rate of 2,208 lambs for 1 day, or 100 lambs for 22 days.

NOTE.—Owing to the dry season plots 17, 5, and 9 had to be resown, and an additional 112 lb. of the same manure was accordingly used.

Plot 5: Sown with Thousand-headed kale and Buda kale in alternate rows. The Buda kale blighted (aphis) badly, the lower leaves being totally destroyed. The Thousand-headed kale was hardly affected and continued to make good growth. It was, however, noticeable that the lambs took all that remained of the Buda kale, and ate the stumps very nearly to the ground before starting on the Thousand-headed.

Plots 9 and 19 were both sown with seed harvested in the Wairarapa three seasons ago as a co-operative experiment. It speaks well for colonial-grown seed of that age that it grew well and produced good crops.

IRRIGATION IN NEW SOUTH WALES.

T. W. LONSDALE.

It cannot be denied that irrigation is one of the big factors in agricultural achievement, and millions of acres of land which have in past years been considered valueless owing to absence of water have by irrigation been made through increased production highly profitable.

While on a recent visit to Australia I was afforded an opportunity of inspecting what is one of the world's greatest irrigation schemes, the land dealt with being known as the Murrumbidgee Irrigation Area. This comprises about 1,250,000 acres of virgin land situated in one of the most fertile parts of New South Wales. The existing rainfall over this area is not sufficient to enable the best results being obtained, but irrigation as now applied is converting what has hitherto been ordinary grazing-country into what will eventually become one of the most intensively cultivated districts in the Southern Hemisphere—in other words, a miniature Holland. When we consider that in parts of South Africa irrigation has raised the value of land from £1 per acre to £25 per acre it will be seen that the possibilities of the area now being dealt with by the New South Wales Government are immense.

Agricultural science has given a great impetus to intense cultivation, and this, combined with the scientific utilization of the principle of irrigation, ensures prosperity for the individual, and ultimately adds to the wealth of the country. The rapid change brought about by irrigation is phenomenal, and a striking illustration of what can be accomplished by irrigation is shown on the Yanco Experimental Farm, New South Wales. This farm is situated on the Murrumbidgee Irrigation Area, and although it is only six years since operations commenced, it seems almost incredible that such a change has been made in the time. The average annual rainfall over the above area is about 16 in., of which 7 in. fell during winter months, the remaining 9 in. falling in the summer months, during which period irrigation is necessary to supplement the rainfall. It naturally follows that an enormous body of water must be conserved to irrigate such a vast expanse of land as 1,250,000 acres.

THE CONSERVATION-WORKS.

The most striking feature of the conservation-works is the great Burrinjuck, which when completed will be the second-largest dam in the world. An expanse of 8,000 square miles of rugged gorges and mountain-peaks rising to an altitude between 2,000 ft. and 5,000 ft. forms the watershed of the Murrumbidgee River. Where the enormous dam has been constructed the Murrumbidgee presses through a gorge that narrows so remarkably as to make it appear that nature herself had foreseen the contingency of the erection of this great dam. Across this gorge a barrier has been flung. The dam when completed will have a maximum height of 240 ft., with a base 170 ft. thick, tapering to 18 ft. at the top, and will throw back the waters into a lake covering 12,740 acres, reaching one way a distance of forty-one miles, in another fifteen miles, and for twenty-five miles in a third direction. Its volume is at present sufficient for requirements, and eventually will be 33,000,000,000 cubic feet, or 766,324 acres—that is, sufficient water to cover that area to a depth of 1 ft.

IRRIGATION OF YOUNG DECIDUOUS TREES, SHOWING CROP OF POT-BOILING ONIONS IN TOP LEFT-HAND CORNER, ALSO BEING IRRIGATED. NOTE HEAD-DITCH IN THE FOREGROUND, FROM WHICH WATER FLOWS THROUGH A PIECE OF ORDINARY GALVANIZED-IRON PIPE REGULATED BY A TIN SLIDE.

These figures are authentic. They were supplied to me by the Commissioner for Water Conservation and Irrigation of New South Wales. A comparison may be made by stating the dam's capacity to

be about equal to that of Sydney Harbour, and it may justly be regarded as one of the greatest undertakings of its kind in the world.

HOW IS SUCH A VOLUME OF WATER DISTRIBUTED?

The liberated waters from the dam flow down the natural channel of the Murrumbidgee for 220 miles to the Berembed Diversion Weir, which turns the irrigation water into the main canal, which, when completed, will discharge 2,000 cubic feet per second. From the main canal, distributary channels deliver supplies of water to each separate farm, and the drainage-channels remove surplus water after irrigation. All the water runs from the storage dam to the irrigated farm by gravitation, thus enabling the water to be supplied at a remarkably low rate. The water is supplied to each holding by means of a Detheridge meter, and each farmer knows exactly the minimum volume of water to which he has a right. This is measured in acre-feet and charged for at 5s. per acre-foot per year. The areas of the farms are from 2 acres to 200 acres, and the range of products varies considerably. The larger holdings are devoted to dairying, lamb-raising, or mixed farming, and already on the Murrumbidgee Irrigation Area there is a butter-factory capable of dealing with the products of ten thousand cows. In addition to this, cheese, bacon, and fruit-canning factories are also established. It is evident that there are great opportunities for the dairyman on irrigated lands. His success is dependent on an unlimited quantity of succulent fodder, and at Yanco irrigation gives him an unfailing supply. Fat-lamb-raising has always been a lucrative industry, and on a

IRRIGATING CARROTS.

DEPASTURING SHEEP ON IRRIGATED LUCERNE.

Note the supply channel in foreground, and the Detheridge meter-wheels which measure the water-supply to the farm.

mixed farm can always be relied upon to yield a handsome return. To the fruit and vegetable grower irrigation is a priceless boon. On the Yanco Experimental Farm peaches, apricots, nectarines, prunes, pears, walnuts, almonds, melons, and citrus fruits, also wine and table grapes, raisins, sultanas, currants, figs, and olives, grow to perfection under irrigation, and returns from £40 to £200 per acre

THREE-YEAR-OLD VINEYARD IN EARLY SPRING.

The land here is so light and open that it has been found necessary to concrete both the supply channel and the settlers' head-ditch to avoid seepage.

have been obtained. Tomatoes, beans, cauliflowers, asparagus, and cabbage yield handsome profits, and the Chinese claim to have produced tomatoes which gave a gross return of £400 per acre. Poultry-farming and ostrich-farming are profitable industries, as everything in the shape of food is produced on the farms, consequently the profits go direct to the farmer.

New Zealand, generally speaking, is endowed with a liberal rainfall, and it is not expected that irrigation will appeal to the farmers of this Dominion. There are in parts of these Islands tracts of land which may at some time become more productive by irrigation, but it is in countries where the annual precipitation is light that irrigation will become an important factor.

In California, the Sacramento Valley alone contains 13,000,000 acres of irrigable land which is to-day unproductive. There are in many parts of Australia vast areas which irrigation will eventually transform, and the Government of New South Wales is aware of the immense latent possibilities of land awaiting irrigation.

HEDGES.

J. H. HUDSON.

I CONGRATULATE the *Journal* on its article on the above subject, and venture to supplement it. The best farm hedge-plant, in my opinion, is hawthorn, because of its slow growth, long life, and resistance to stock. Others are inferior in proportion as they differ. Of English hedge-plants, perhaps holly and sloe are the nearest to hawthorn in merit. African boxthorn on alluvial ground also approaches it. Hawthorn has two serious enemies—pear-slug and root-fungus. New Zealand practice, following recent English method, is to plant hawthorn in a continuous hedge without trees. This favours the natural enemies, for root-fungus attacks a plant in a hedge and as it dies spreads in opposite directions along its host. The absence of shade favours pear-slug, as its presence retards its action. I have continually under my eyes the benefit derived from oaks and locusts (*Robinia pseudoacacia*) in a hedge. Hawthorn grows close to oak for at least twenty years, and remains green into autumn in its shade. Locust is a legume, and the best grass in the paddock is under its nitrate-yielding cover. It suckers, but cattle have a preference for it. Oak and locust strengthen a young hedge and checkmate root-fungus.

PREPARING HONEY FOR MARKET.

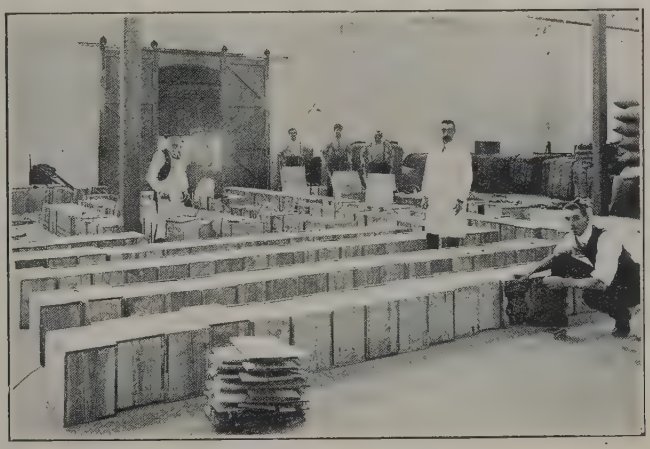
L. BOWMAN.

HONEY, one of the finest articles of food, is supplied almost direct from a large variety of melliferous flora, and is worthy of a higher position in the list of foodstuffs than that which it occupies at present. To raise it to the level it so richly deserves, much can be accomplished by the beekeeper giving more thought and care in preparing the product of the hive, to enhance its value by putting into his customers' hands neat and attractive packages. It is a well-recognized fact amongst business men of the present commercial age that competition and enterprise demand this.

There are a few isolated individuals who are not too particular as to how their honey is put up, but, fortunately for the industry, they are being gradually left behind, and will eventually go out of the business. On the other hand, there are others who are most particular and exacting, the ultimate result being satisfied customers and repeat orders, and the assurance of a sound and successful business.

The question is often asked, "How am I to deal with honey in order to accomplish this success?" First, by getting into a good clover district; second, by keeping together all honey gathered during certain parts of the season; and again by having plenty of tankage. I have advocated large, deep, water-jacketed tanks, capable of holding three or four days' extracting. The size is best determined by the beekeeper, but it is always wise to work on the basis of your future estimated output. It is assumed that the larger beekeeper extracts at the middle and the end of the season, and the size of tanks is subject to modification. In large commercial apiaries, where honey is produced by the ton, a tank capable of holding 2 or 3 tons would be found useful, and should be fitted with two large honey-gates and a mechanical stirrer. This may be termed the blending-tank, it being a well-known fact that even in the same apiary honey does vary slightly in different stocks and supers. The great advantage of having uniform colour, flavour, aroma, grain, and condition is obvious. I purpose touching on the stirring of honey later, when dealing with granulation. Leading from the extractor there should be an intermediate

tank, also water-jacketed, capable of holding about 10 to 15 cwt. This we might term the settling-tank; and in order to ensure that all particles of dirt, wax, and other undesirable substances are eliminated it should be fitted with the necessary strainers. The strainers should be readily removable for the purpose of cleaning, and a suitable honey-gate should also be provided. All tanks should be provided with good, close-fitting covers. Even with the most careful it will be found that, although very fine strainers are used, a film of froth rises to the surface, and this should be carefully removed after standing two or three days, the procedure being repeated a second time if necessary.



HONEY PACKED FOR EXPORT.

There is one thing which has come before the notice of the writer in regard to preparing honey: Beekeepers will take the most infinite pains in selecting and staging honey for competition on the show-bench in order to win a prize and receive the much-coveted ticket, yet do not consider it worth their while to exercise even ordinary care in sending honey away in bulk, which is to bring them in a better remuneration.

After straining and settling, the honey should be run into the blending-tank, and, as soon as it is filled, thoroughly stirred to ensure uniformity. It is as well to allow it to stand in the tank for two or three days before running off. The fact that stirring hastens granulation is well known, and the practice has been made use of for a number of years, and for the last ten years to the writer's knowledge, in Canterbury. The hot-water jackets on the

tanks are to keep honey warm and facilitate the rising of the many thousands of fine air-bubbles (froth). If the beekeeper has a small boiler, similar to those used for heating a greenhouse, and this has a flow-and-return pipe, it could be connected up to do double duty—namely, keep both hot-water jackets and also the honey-house warm, as honey is much easier to extract under these conditions.

There are many who favour the shallow tanks. All I have to say is, if you have found them more suitable to your particular requirements and that they give you satisfaction, by all means stick to them.

GRANULATION.

Some honeys are much slower than others in granulating, and there is a very wide range in the grain, running from an exceedingly rough grain right through to silkiness. It has been my experience to find that the quicker honey commences to granulate after extracting, the finer the grain, although there are exceptions to this rule, while those which are slow are generally coarse. There are also other circumstances which influence the rapidity of granulation and the size of the grain—namely, the source from which the nectar is gathered, the climatic conditions during the secretion of nectar, the amount of dextrose and levulose contained in the honey, and the subjection of honey to high temperatures. The latter is often done to retard granulation, but after a time it granulates with a coarse grain unless manipulated.

HASTENING GRANULATION.

If it is desired to hasten granulation, this is accomplished by putting into the blending-tank a tin of some fine-grained honey kept over from a previous season. A good method is to warm it slightly to bring it to a semi-soft condition, but on no account liquid. It will then readily mix with the liquid honey in the tank, being thoroughly stirred to ensure that the granular nucleus permeates throughout the bulk. This practice is a well-known one, and has been adopted by beekeepers for quite a number of years, and always ensures a consistent grain.

PACKAGES.

A few words as to packages. It is not an uncommon thing to find that both large and small producers are required to put up their produce in a form ready to go on the merchants' shelves.

For the ordinary retail trade the white flint-glass jar, holding 1 lb. or 2 lb., with screw-tops and neat labels, holds the first place. The screw-top jar is much appreciated by the purchaser, as they can see what they are buying, and the jars, when empty, are put to other uses, but the price prohibits their exclusive use. Gaudy, crude-coloured, cheap, or indifferently printed labels should be tabooed.

The next best is a neat waxed-parchment pot for 1 lb. or 2 lb., daintily printed; this looks well, and can be purchased at a nominal price. There are also some tins nicely lithographed now on the market; but to my idea, to put up small quantities in tins for retail purposes brings honey down at once to the level of syrup or treacle put up in like form.

Leaving the small trade and getting into what might be called the intermediate one, there are tins made to hold 7 lb., 10 lb., and 12 lb., which find a fair sale.

In dealing with honey in large quantities and bulk lots for export, a tin holding 56 lb. net has been generally adopted, and has found favour throughout the Dominion, and the old style, 60 lb. tin, is going out of existence. Honey is quoted by the hundredweight, and the half-hundredweight tins are found convenient on this account.

In packing honey for export it is desirable to have uniformity in this matter. A good case bound with metal strapping, and neatly branded, is also essential, as it makes every consignment look like business, and is a standing advertisement wherever it goes.

A WELL-PLACED APIARY.

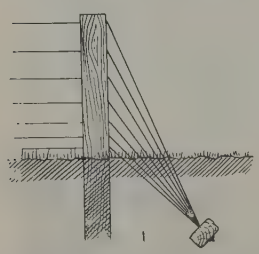
FENCING.

W. H. DUNCAN, Feilding.

A KNOWLEDGE of fencing operations is a very important item indeed in farm-management. It was therefore with much interest that I read Mr. Honeybun's article on "Wire Fencing for the Novice," which appeared in the May, 1914, issue of the *Journal*. Mr. Honeybun has brought out many useful points, and his article is one which should be of no little value to those who follow out his instructions. On reading the article it appeared to me that there were perhaps one or two points in fencing, which are practised by farmers about this district, which may well supplement Mr. Honeybun's excellent advice.

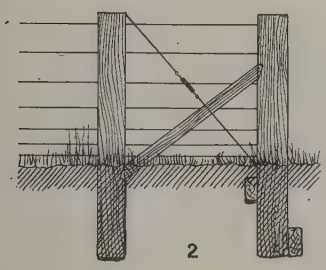
In the first place, it is rather important, in putting in posts along the guide-wire—and this Mr. Honeybun emphasized—not to allow the posts to touch the wire. Invariably a beginner is so anxious to be exact that he allows the posts to just touch the wire, which means that by the time the posts are rammed tight the wire will probably have been pushed out of alignment anything from a quarter of an inch to a full inch or even more. Several more posts will probably be put in before this is noticed, and if the worker is pressed for time and cannot at once correct the mistake it will probably remain a permanent eyesore.

Strainers are costly in this vicinity, and also in many others —*i.e.*, in the region of 8s. to 10s. each—and are not too easily got at that, so that for dividing-fences recourse has to be made to anchoring an ordinary good fencing-post to take the orthodox strainer's place, and just as good and permanent a job can be made in this way. Several methods of doing this are in use, the most common probably being to sink a piece of matai or rata, about the size of or larger than half a good post, across the back of the end post—say, 3 ft. from the post and 3 ft. in the ground. Attach each wire separately to this and lead through the post, previously bored to the gauge of the fence. Before ramming in, cut a narrow channel from the anchor towards the post



to allow the wires to feed up, and let the anchor lie against the solid side of the trench. The wires can be strained up like fiddle-strings, as there is less fear of the anchor shifting than there is of pulling over a poorly-put-in ordinary strainer. *Inter alia*, I may say a piece of sound rata or matai, if nothing better is available, buried as described away from atmospheric changes, will last almost indefinitely. The end post is best set a little back from upright, or temporarily stayed with a spare post till the wires are all tightened up; otherwise, if the bored post is at all soft the wires will cut in and pull the post with them till they get tight on the anchor side.

Another very good method is to wire half a post as a foot at the back of your end post, and the other half-post (or its equivalent) in front of it to lie just beneath the ground. Cut your trench just large enough for the post and foot to drop in: this leaves the top of the post with an inclination of, say, 3 in. back from your line of fence. Ram in well, attach the guide wire or wires, and tighten up. This will straighten your strainer up. Put in the first post of the fence to act as a foot for your stay, also slightly out of plumb the opposite way. Correct this with a wire strained from the top of this post to the foot of the strainer. You then have a solid panel of fencing that must shift bodily when the rest of the wires are put on. The method will be found cheap and very satisfactory.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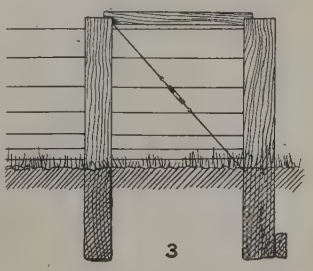
Another and more common method than No. 2, if nothing better be available than a piece of 3 in. or 4 in. by 2 in. scantling, which will rot in the ground, is to merely foot the strainer and check the scantling in the tops of the strainer and first post, staying back with wire from the top of the first post to the foot of the strainer as before described. This is wonderfully rigid, but is not as satisfactory as No. 2 method. Always put your stay at about half the height of the strainer. You then have an equal strain of wires above and below it. A short stay placed high up on the strainer exerts an enormous lifting-power.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The writer has found both hinau and red-birch very fair fencing-material where totara is too costly. Puriri and manawha, spoken of by Mr. Honeybun, are both of the very best, but are purely northern woods, the former coming little farther south than Gisborne on the east coast. The latter is a swamp wood, where it has probably lain for centuries. It is unknown in the Manawatu.

SPIDERWORT (LEYCESTERIA FORMOSA).

E. H. ATKINSON.

SPIDERWORT has now become naturalized in many parts of the country, and, as it has recently been added to the Third Schedule of the Noxious Weeds Act, it is thought desirable, in the interests of farmers and others who may come across the plant, to publish illustrations and a brief description.

Leycesteria formosa, which belongs to the same family as the honeysuckles and weigelias of gardens, is a native of the temperate Himalayas. It has been in cultivation for many years in New Zealand, and was recorded by Cheeseman ("Manual of New Zealand Flora") in 1906 as an "occasional garden escape." Since then it has increased considerably, and in some localities forms quite a feature of the vegetation. It is evident that birds have been the chief agents in causing the rapid spread of the plant, the sweet and juicy fruits being very attractive to them, while the small seeds would readily pass uninjured through the alimentary canal.

Spiderwort grows in situations similar to those in which tutsan (*Hypericum androsaemum*) is found, and may ultimately occupy the same position among weeds as that plant now does.

Although widely distributed in New Zealand, it is by no means abundant throughout its area of distribution. Taranaki and Wellington are the provinces where it has secured the strongest hold, but it is only in a few localities within this area that it is really common.

Spiderwort is a shrub which in sheltered places reaches the height of 10 ft. or 12 ft., but it is often found much smaller, and flowers freely when only 3 ft. or 4 ft. high. The general appearance of the plant is very distinctive, owing to its peculiar mode of branching. There is no main stem, but a large number of shoots of about the same length and thickness spring from the rootstock.

FRUITING-BRANCH OF SPIDERWORT. HALF NATURAL SIZE.

They are at first nearly vertical, but after a few feet begin to spread out, the tips of the branches being horizontal or even drooping. The stems are smooth, green, and hollow, and bear very few branches.

The leaves, which are set in opposite pairs, do not as a rule spread out all round the stem, as is the case with those of most shrubs, but lie in one plane, like the divisions of a fern-frond. They are ovate or egg-shaped in outline, the wide end being

PLANT OF SPIDERWORT, SHOWING STIFF UPRIGHT GROWTH AS THE RESULT OF CUTTING.

nearest the short leaf-stalk, but, instead of being rounded, the other end tapers gradually to a long narrow point. Occasionally some of the leaves near the base of the plant are toothed or even lobed, but as a rule the leaves are without any indentations, though their crinkled and waved edges give them the appearance of being toothed.

The flowers are borne in drooping spikes, which spring from the axils of the uppermost leaves. Set round the stalk of the spike

are from two to eight rings of radiating floral leaves or bracts, which resemble the foliage leaves in shape, though they are never much more than an inch in length and are usually tinged more or less deeply with purplish-red. It is between these rings of bracts that the flowers are borne. Each flower is about three-quarters of

PLANT OF SPIDERWORT, SHOWING STEMS; THOSE IN FRONT EATEN BY GOATS.

an inch in length, trumpet or funnel shaped, and pinkish-white in colour.

The fruit when ripe is about as large as a pea, succulent, and berry-like, and contains numerous small seeds. It varies in colour, according to the degree of maturity, from greenish to deep reddish-purple or almost black, and is crowned at the tip with the remains of the flower.

EGG-LAYING COMPETITIONS.

A. ROSE.

In the results of the last competitions just completed I was much struck by the fact that many strains finished the term with a lower average than one would expect to see. Instead of an improvement there is an appreciable falling-off in egg-laying capacity. On the other hand, some strains have made a steady advance on their previous performances. From a study of various competitions and a comparison of averages from year to year one is compelled to admit that there is a limit to output in any strain, and that this maximum capacity is by no means stationary, but rather a matter of one or two years at the most before the falling-off tendency takes place.

Certainly the weather differences have some influence on domesticated poultry, but not to an appreciable extent. We notice how a breeder comes rapidly to the top with a strain on which he has expended much time and patience; his record is the topic of conversation in every meeting of poultrymen. Why is it that his fame is so short-lived? There is a reason not far to seek, in that any line of poultry, if bred up to a high pitch of egg-laying power by continuous selection of the most prolific specimens as breeders, becomes lowered in its natural functions to such an extent as to become unfit to propagate its own type. This may seem a somewhat sweeping statement to make, but it is nevertheless quite true. Many men have purchased winning pens from competitions only to find that the heavy egg-production had unfitted them for breeding purposes. Again, poultrymen all admit that it is surprising how, in going through a flock to pick out the "top-notchers," one finds how few, comparatively speaking, there are. Sometimes one will find only about 20 per cent. are of the desired type and development for the purpose in view. In some instances the number is very much lower. It is obvious, therefore, that nature demands some recognition in this unnatural method of treating her feathered subjects. It would seem, then, that a poultryman must limit his demands on his flock to a reasonable extent, so that he will not be troubled with a fluctuating output, but rather maintain an even standard, which in the end will be found more profitable.

Another thing of great import is that fowls are attacked by many diseases, which may be largely avoided by keeping the flock sound in disease-resisting power. The foresighted man will be found preparing a second strain to take the place of the one which is showing the effect of artificial treatment, for it is, strange to say, a rare thing for a strain to last more than two or three years and still be as profitable as if replaced by a new strain or by mating. In many cases high production among the heavy breeds is resulting in an increasing number of the undesirable small egg, and, in the case of continual breeding of these same strains, a distinct falling-off in the size of the birds reared from them. White Leghorns are an easy breed to obtain regular results from, and they are amenable to the influence of a fresh mating. Being of one colour, the type and characteristics are easily picked out when mating up pens, thus facilitating what is undoubtedly the most important work of the season. Many breeders advocate using only the largest specimens to breed from; but while size generally goes hand-in-hand with constitution, it is notable that heavily framed birds often lay the smallest eggs, and that in time continuous use of this class of fowl would result in a reversion to the old type, which is now discarded by the utility poultryman. Generally speaking, the medium-sized hen or pullet will be found the most satisfactory in every way, as her own bodily sustenance will require less upkeep than that of her heavier sister, leaving a bigger margin of nutriment to be used in egg-production. I am of the opinion that if, say, the ten highest-average pens were photographed every year, at the close of each competition some interesting comparisons could be made in types, characteristics, and heads of the various breeds. The cost would be a mere bagatelle to the educative value of such illustrations.

A recent estimate places the number of horses purchased in the United States for military purposes since August at 125,000. In Kansas, Omaha, and St. Louis buyers representing Great Britain, France, Belgium, and Italy have all been in attendance at the horse-markets in the past few weeks.—*Farm and Dairy.*

Grass-grub is this year very prevalent at Ruakura, and is doing much harm to the swede crops by eating off all fibrous roots. The same grub is also responsible for a poor take of young grass in field 41, which was sown during March, 1915. Young plants of Italian rye-grass suffered mainly by its ravages, but in the grass experimental plots crested dogstail was worse, and in some patches is eaten right out.

RAPE-SEED.

A. H. COCKAYNE.

SPEAKING in quite general terms, there are two main classes of rapes. The one is more or less a biennial, and is the kind in customary use in New Zealand as a fodder crop. The other, of which there are many varieties, is grown primarily for seed-production alone, the crop being mainly used for the production of oil and various animal-foods. This type of rape is known under the trade terms as "oil" rape and "bird-seed" rape. The forage rapes are generally sold under the name of English or Dutch rape, England and Holland being the two main countries producing seed of this description.

Owing to the high price and limited supply of guaranteed English and Dutch rape, seed produced in other countries is being freely offered in New Zealand. The two main sources from which seed is being offered are Japan and France. From inquiries instituted by this Department it has been shown that the proper forage rape of the Dwarf Essex type is produced in certain portions of the Japanese Empire. The bird-seed rapes are also largely grown there, so that great care has to be exercised in the purchase of seed in order to secure the correct type.

It appears almost impossible to tell from the seed alone whether a sample is true forage rape or bird-seed rape. It has, however, been noticed that the bird-seed varieties sold as such have smaller and more irregular seeds than the ordinary type of English or Dutch rape.

With regard to French rape-seed the same difficulty exists as with that of Japanese origin. A certain amount of forage rape is produced in France, but the majority is of the bird-seed type. The following extract of a letter from one of the leading English seed-houses emphasizes the difficulty of securing reliable French seed: "We would not dare to ship French rape-seed for growing purposes, as after repeated trials in our climate results are most unsatisfactory. The plants are apt to flower very early, and they give no branches—just a single stem with a few leaves on the top." It is evident from the above quotation that the plants referred to are certainly of the bird-seed type, but this

by no means proves that all French rape is useless for New Zealand requirements.

The New Zealand rape crop is, however, such an important one to the grazier that I would strongly advise all farmers to sow only seed that can be guaranteed to be of the forage type, and not to allow the question of price to guide their seed purchases. If, on the other hand, true English or Dutch rape is not procurable, then the farmer should be careful to avoid the purchase of any foreign seed that is small in size or contains a large number of reddish-coloured seeds.

SEMI-OFFICIAL TESTING.

CERTIFICATE-OF-RECORD AYRSHIRES.

W. M. SINGLETON.

SINCE the last list of certificate-of-record Ayrshires was published in the *Journal* the following cows have finished their record, and their owners have received certificates :—

Name of Cow.	Name and Address of Owner.	Age at starting Test.	Fat req'd. Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		Y. dys.	lb.		lb.	lb.
Two-year-old Class.						
Bluebell of Glenweir	Weir Bros., Pukehiki	2 355	276·0	365	8,214·40	371·02
Three-year-old Class.						
Dom. Parkhead Dewdrop	Moumahaki Experimental Farm	3 259	302·9	302	10,952·10	360·34
Mature Class.						
Minnie of Glenweir ..	Weir Bros., Pukehiki	6 11	350·0	363	11,471·10	528·92
Heather Jill of Greenfields	C. E. C. Webb, Koputaroa	10 104	350·0	365	9,328·70	468·90

Under another heading we are commenting on the performance of two of these cows. The record of Heather Jill of Greenfields, owned by Mr. C. E. C. Webb, of Koputaroa, merits special attention. This cow, at an age which would suggest that she had passed her zenith, has produced a fine record, which places her third in her class. Her owner has every reason to feel satisfied with his first experience of placing a cow on semi-official test.

KING COLE AND HIS DAUGHTERS.

The first Ayrshire bull in New Zealand to qualify through the record of his daughters is King Cole, which headed the herd of Messrs. Weir Bros., Pukehiki, Dunedin. The illustrations of this bull and his daughters show constitution and that size which is a necessary warranty of great capacity to convert feed into milk. The oldest daughter tested is Minnie of Glenweir. She is a credit to her breed not only in production, but in dairy type as well.

KING COLE.

Her record of 528·92 lb. fat in 363 days, and her calving again within two months of finishing her milking-period, evidences a good performance, and places her as leader of the Ayrshire's mature class. She replaces in this class Fancy IV of Cambridge, owned by Messrs. Watt Bros. Lilly of Glenweir, in the three-year-old class, has attained the honour of second position, since her record is exceeded by that of Kanadale Fanny by somewhat over 2 lb. fat. Bluebell of Glenweir, with her record of 371·02 lb. fat, replaces her sister Miss Russell for the best two-year-old.

MINNIE OF GLENWEIR.

BLUEBELL OF GLENWEIR.

THE WORLD'S BUTTER-FAT RECORD.

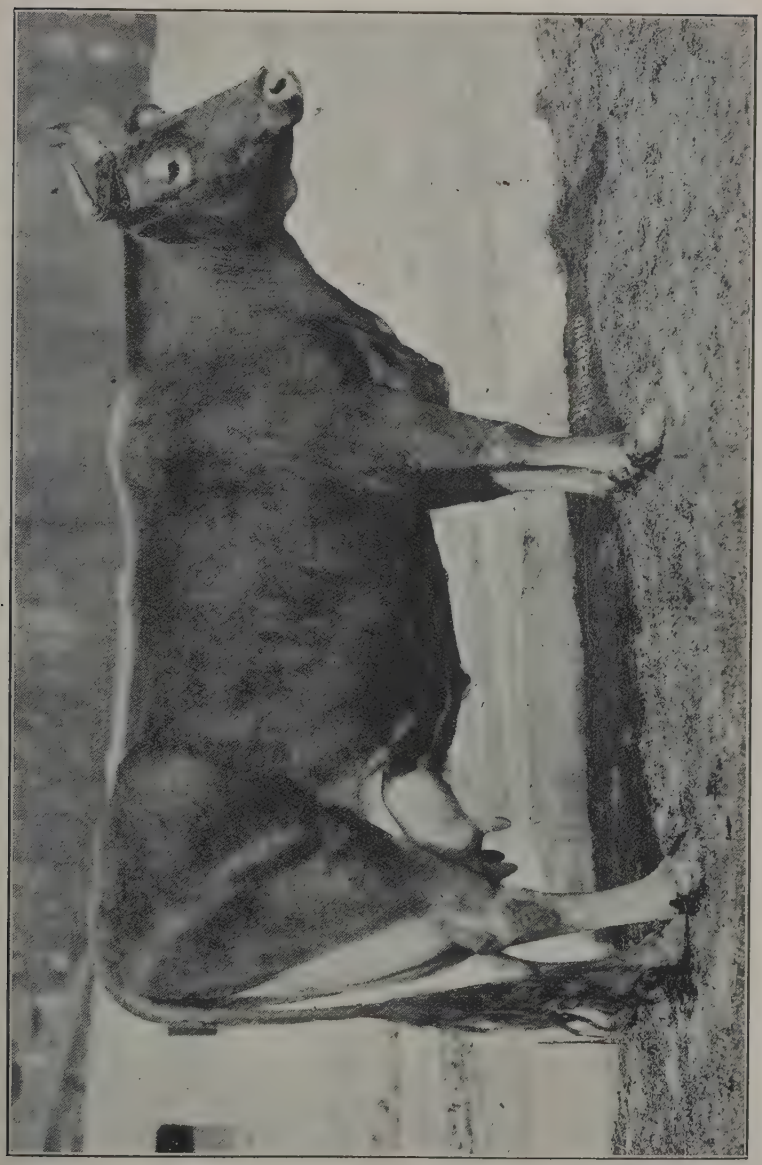
THE photographs on the following pages, which have been forwarded by Mr. E. Clifton, New Zealand Commissioner in America, are of two American cows, Murne Cowan and Finderne Holingen Fayne. The mature Guernsey cow, Murne Cowan, it is claimed, established a world's record by producing in twelve months 24,008 lb. of milk and 1,098·18 lb. of butter-fat. She is owned by the Anna Dean Farm, Barberton, Ohio.

The honour of having the record for the greatest yearly yield of butter-fat did not for long remain with Murne Cowan. The latest world's butter-fat champion is the American Holstein cow, Findere Holingen Fayne, which freshened at the age of 3 years 4 months 14 days. She is owned by the Somerset Holstein Breeders' Company, New Jersey, and in 365 days is credited with a production of 1,116·05 lb. of butter-fat from 24,612·8 lb. of milk. She is said to have been pregnant for some five months of the twelve on test.

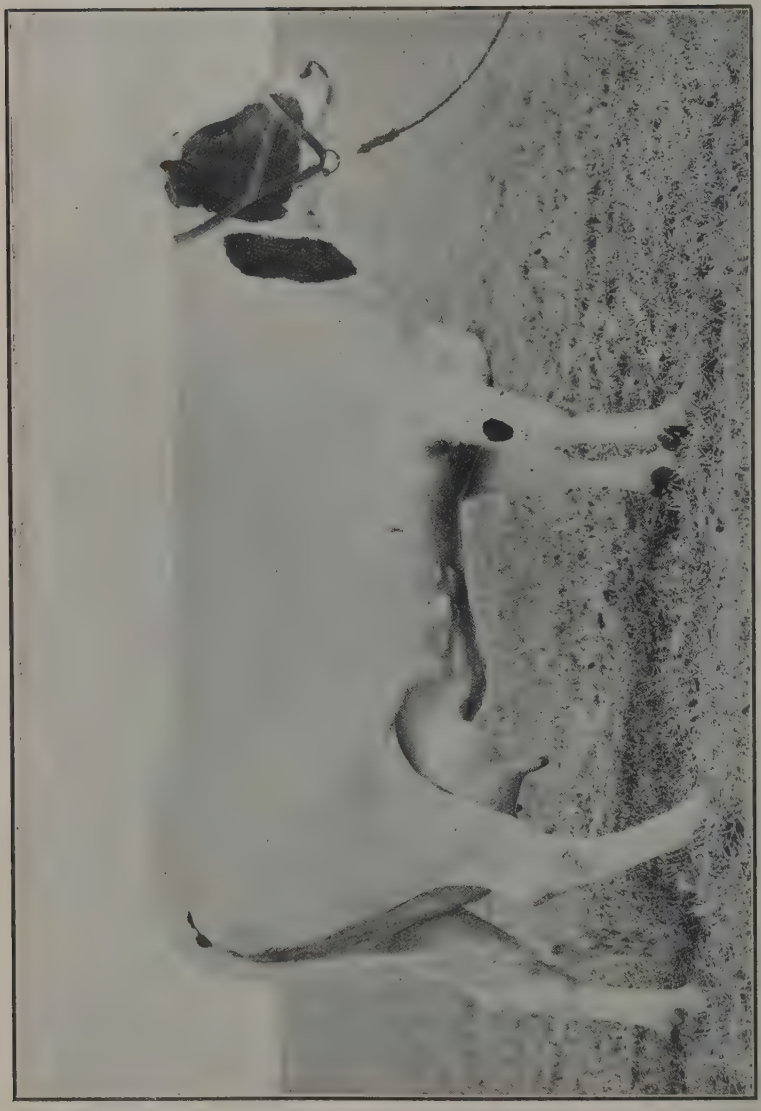
A half-sister of this heifer's sire was selected for the Department of Agriculture, Industries, and Commerce by Mr. W. M. Singleton, Assistant Director of the Dairy-produce Division, during his last visit to America. Finderne Holingen Fayne's record suggests that her relatives should be an asset to New Zealand. Mr. Newton King has also imported a bull which bears the same relationship to this world's record heifer as does the Department's heifer at Weraroa.

The mangel crop at the Ruakura Farm of Instruction made excellent growth during the month of May, for after a dry spell plants of this nature grow late into autumn. Rhizoctonia disease is almost absent this season, probably due to lime. This is highly satisfactory in comparison with last year's results.

At the Ruakura Farm of Instruction on the 2nd March 6 acres were sown down with white mustard as a green-manuring crop experiment on land which was last year devoted to cereal plot experiments, and there is no more striking experiment on the farm at the present time than this, showing the difference between the results obtained by following a barley crop as compared with an oat crop. The edges of the two plots are as much marked as if drawn with a line. The mustard following barley is from 6 in. to 9 in. high, while that following oats is 2 ft. high.



GUERNSEY COW, MURNE COWAN.



HOLSTEIN COW, FINDERNE HOLINGEN FAYNE.

CERTIFICATES IN FRUIT PACKING AND GRADING.

FOR some years past classes in the grading and packing of fruit have been held under the supervision of the orchard instructors in the main fruitgrowing districts. It is now intended to supplement this work by the holding of practical examinations in these subjects. On the results of these examinations certificates of proficiency, similar to those with regard to spraying and pruning, will be issued to the successful candidates. It is considered that these certificates will be of great value to all those desirous of employing expert packers and graders, and will act as a guarantee of the efficiency of the holders in these particular branches of orchard work.

The various orchard instructors have been notified of the intention to hold these examinations, and are circularizing the information in their respective districts. Intending candidates should communicate as soon as possible with the Director of Orchards, Gardens, and Apiaries, Wellington, so that suitable dates for the holding of the examination can be arranged.

AN INTERESTING FRUIT EXPERIMENT.

MR. WILLIAM LANCASTER, of Pirongia, drew my attention to a large peach-tree in his garden, loaded with young fruit, and also having a Burbank plum grafted on to the trunk, the plum graft of several years' growth also being loaded with fruit. The peculiarity lies in the fact that before the plum was grafted on to the peach the peach was always badly affected with leaf-curl, and the fruit was small, hard, and did not ripen well, coming to maturity in February. The owner had decided to cut the peach down as soon as the plum graft had taken, but something turned up and the peach-tree was left untouched. A marvellous transformation has taken place. Leaf-curl has disappeared, the peaches have doubled in size, and do not ripen until April, nearly two months later. Some peaches last year attained the weight of 11 oz., and the whole crop, 140 lb., averaged 3 lb. to the seven peaches.

The question arises, can this improvement be attributed to the grafting-in of the plum growth, and would it be worth experimenting in grafting peach grafts on to blight-resisting plum-trees, such as the Christmas plum?—*C. E. McPhee.*

WEEDS.

A. HUGHES.

WEEDS are one of the greatest troubles a farmer has to contend against, and are far more plentiful than they ought to be. Any plant growing where it is not wanted is a weed. Unfortunately, the farmer does not seem to realize the great harm done by weeds occupying the room that should be taken up by more profitable plants that they are robbing the crop of nourishment, light, air, and space.

If certain weeds are not included in one of the schedules, and the farmer is not compelled to cut them, in a great many instances he will not do so even after his attention has been called to them. I once called on a settler who had toad-flax (*Linaria vulgaris*) on his farm, and told him it was a bad weed which spreads very quickly, and that it would be much to his advantage to eradicate the plants that were showing up, and not allow them to seed. He asked me if it was a gazetted weed. I said, No, but that it was a very injurious one. He then said, "If it is not a gazetted weed, what the h—— are you rearing at?" This, unfortunately, is an attitude taken up by a great many farmers as regards their weeds, whereas, on the other hand, some are only too anxious to do their best to eradicate the pests. The former wait until the district is covered with a weed and then complain that it is "gazetted," and they are compelled to cut it, and say that the land is not worth the expense of clearing. Had heed been paid when first the warning-note was sounded, probably the Dominion would be practically free of Californian thistles at the present day. It is very little good one farmer clearing his land of weeds if his neighbour neglects them and allows the seed to be carried over the hedge and restock the clean farm. Farmers should combine to exterminate weeds by tillage, cutting, &c., and also to ensure the purity in farm seeds.

I was once called in to see a weed that was new in the Palmerston South district, and found it was pennycress (*Thlaspi arvense*). This had been imported from America amongst some pea-seeds.

Some of the Farmers' Unions are taking up the subject of noxious weeds. It would be well if the movement were more general, so that a great forward movement might be instituted in order to remove this menace to the agricultural industries of the Dominion.

SEEDS AND THEIR IDENTIFICATION.

CONTINUED.

E. BRUCE LEVY.

(1.) Californian Thistle (*Cnicus arvensis*).
(2.) Spear or Scotch Thistle (*Carduus lanceolatus*).
(3.) Winged Thistle (*Carduus pycnocephalus*).
(4.) Common Sowthistle (*Sonchus oleraceus*).
(5.) Prickly Sowthistle (*Sonchus asper*).
(6.) Field Sowthistle (*Sonchus arvensis*).
(7.) Nipplewort (*Lapsana communis*).

CALIFORNIAN thistle is perhaps the most dangerous weed-seed that is found in agricultural seeds, and in buying certain seeds, particularly alsike and timothy, the greatest scrutiny should be exercised in order to be sure that no seeds of this weed are present. Californian-thistle seed is fairly characteristic, and when once seen should afterwards be easily detected in a line of seed. Spear-thistle, winged thistle, and nipplewort are sometimes taken for Californian-thistle seed. In oats small thistle-heads are often present.

CALIFORNIAN THISTLE.

Size: Average length, $\frac{1}{9}$ in.; average width, $\frac{1}{24}$ in. Colour: Light brown, fairly constant. The surface is smooth and slightly glossy. Several slender shallow grooves extending from the base to the apex are often noticeable.

Shape: The seed is oblong and somewhat flattened; it is thickest along the longitudinal centre. The edges are blunt and rounded. The base is bluntly pointed. The apex is distinctly crown-shaped, the rim of which crown is raised and often expanded. The rim is in colour a little lighter than the general colour of the seed, being a pale straw. The centre of the concave crown is raised by an abrupt appendage which marks the place of attachment of the style of the pistil to the developed ovary (the seed). (The pistil is the female organ of a flowering-plant, consisting of ovary, style, and stigma.) The point of the projection is often quite dark in colour. The seed is usually straight, but sometimes is slightly curved.

CALIFORNIAN THISTLE (CNICUS ARVENSIS). ENLARGED 6 DIAMETERS.

SPEAR-THISTLE (CARDUUS LANCEOLATUS). ENLARGED 6 DIAMETERS.

WINGED THISTLE (CARDUUS PYCNOCEPHALUS). ENLARGED 6 DIAMETERS.

THISTLE-HEADS. — TOP, CALIFORNIAN THISTLE; MIDDLE, SPEAR-THISTLE; BOTTOM, WINGED THISTLE. ENLARGED 2 DIAMETERS.

SPEAR-THISTLE.

Size: Average length, $\frac{1}{6}$ in.; average width, $\frac{1}{16}$ in. A larger seed than that of Californian thistle.

Colour: Whitish, tinged with yellow, surmounted by fine longitudinal streaks of black which cover the seed from the base almost to the apex. The surface is smooth and somewhat shiny. Often slender longitudinal grooves, extending from the base to the apex. The seed has a brighter appearance than that of Californian thistle.

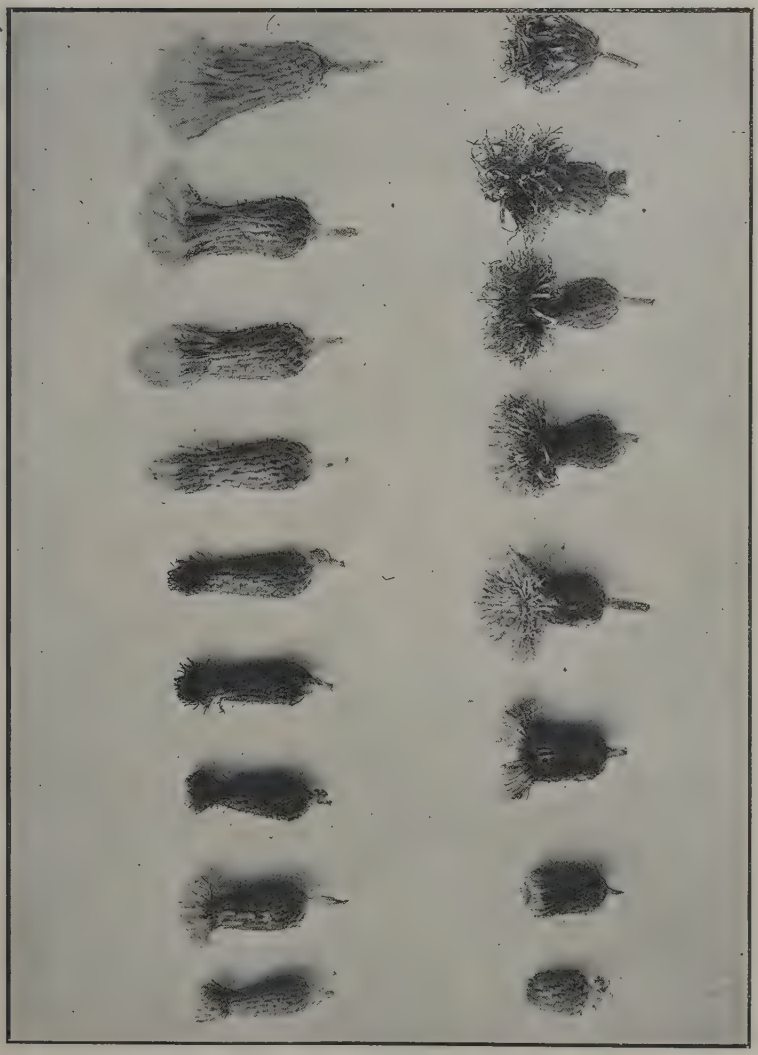
Shape: The seed is oblong and somewhat flattened, and is thickest along the longitudinal centre. The edges are blunt and rounded. The base is bluntly pointed. The apex is crown-shaped, the rim of which crown is raised but seldom expanded. The rim is in colour a greenish-yellow, and is devoid of any black markings. The centre of the concave crown is raised by an abrupt appendage as in Californian thistle. The appendage is large and not conspicuously dark. The crown, in comparison with the size of the seed, is smaller than that of Californian thistle. The seed is fairly straight, but often has on the one side a distinct shoulder towards the crown end of the seed, which gives the seed a somewhat hunched appearance. Often one edge of the seed is straight, while the other is distinctly arched.

WINGED THISTLE.

Size: Average length, $\frac{1}{6}$ in.; average width, $\frac{1}{15}$ in. About the same size as spear-thistle seed.

Colour: A flat slaty-brown colour. Very uniform. The surface is smooth and somewhat shiny, conspicuously marked by slender grooves extending from the base to the apex.

Shape: The seed is oblong and somewhat flattened; is thickest along the longitudinal centre. The edges are blunt and rounded. The base is very bluntly pointed. The apex is distinctly crown-shaped, the rim of which crown is raised and expanded. The rim is in colour the same as the general colour of the seed. The centre of the concave crown is raised by an abrupt appendage, as in Californian and spear thistle. The appendage is large and is of an orange colour. The crown is larger than that in spear-thistle. The seed is straight, very seldom slightly curved.



HEADS OF CALIFORNIAN THISTLE, IN THE ORDER OF THEIR STAGES OF DEVELOPMENT: TOP ROW, THE FEMALE; BOTTOM ROW, THE MALE. [*A. H. Cockayne, photo.*

THISTLE-HEADS.

Small thistle-heads are often present in lines of oats, but are easily distinguished the one from the other. All three vary very much in size.

Californian Thistle.—The heads of Californian thistle are a dirty straw colour, and are devoid of spines, the bracts (scale-like leaves) of the flower-head ending simply in a short drawn-out point. The bracts are closely appressed and form a compact head. The male and female heads are readily distinguished the one from the other. The male heads are nearly round, are short and stumpy, more or less flattened on the top; the female heads are more oblong and are narrowed in at the top. The majority of the heads found in cereals are immature and do not contain fully developed seeds. In lines, however, that are harvested late in the season fully developed heads containing fertile seeds are not infrequent.

Spear-thistle.—The heads of spear-thistle are at the base a dirty straw colour. The bracts terminate in fairly long stiff spines of a lemon-yellow colour; midway they are purple in colour. The heads spread out much more than do those of Californian, the bracts being not closely appressed. The presence and colour of the spines, however, are quite sufficient data from which to distinguish these two thistle-heads. Spear-thistle heads present in cereals are always immature and never contain any fertile seeds.

Winged Thistle.—The heads of winged thistle are long and of fairly light straw colour. The bracts are long and not closely appressed to each other. They are drawn out to a fine point and are curved back. The heads of winged thistle are very apt to cling to wool, and travelling sheep often spread this plant over wide areas.

COMMON SOWTHISTLE.

Size: Average length, $\frac{1}{10}$ in.; average width, $\frac{1}{24}$ in.

Colour: Light to a dark brown, inclining to chestnut. The surface is rough, being completely covered by minute tubercles.

Shape: The seed is oblong, straight, and much flattened. On each edge and down the middle from the base to the apex are ridges which also are tubercled. On each side of the middle ridge is a fairly conspicuous groove extending from the base to the apex. Each groove is often bordered by two slight ridges, one on each side. The seed is bluntly pointed at the base and rounded somewhat at the apex. A very small crown is present.

COMMON SOWTHISTLE (SONCHUS OLERACEUS). ENLARGED 6 DIAMETERS.

PRICKLY SOWTHISTLE (SONCHUS ASPER). ENLARGED 6 DIAMETERS.

PRICKLY SOWTHISTLE.

Size: Average length, $\frac{1}{6}$ in.; average width, $\frac{1}{30}$ in.

Colour: Light to a fairly dark brown. Gernerally not so dark brown in colour as is common sowthistle. The surface between the ridges is smooth and not tubercled.

Shape: The seed is oblong, straight, and much flattened. On each edge is a ridge, and on each side three ridges extending from the base to the apex. No grooves are present. The seed is bluntly pointed at the base. The apex is also bluntly pointed, and not so rounded as in common sowthistle. A very small crown is present.

FIELD SOWTHISTLE.

Size: Average length, $\frac{1}{11}$ in.; average width, $\frac{1}{32}$ in.

Colour: A dull dark-reddish-brown. The surface is rough, being completely covered by minute tubercles, as in common sowthistle.

Shape: The seed is oblong, straight, and slightly flattened. It is markedly ridged, there being one on each edge and five on each side, extending from the base to the apex. The middle ridge and those on the edges are the most pronounced. The seed is very bluntly pointed, the base and the apex being about evenly so. A crown is present, which in comparison is larger than that in common and prickly sowthistle.

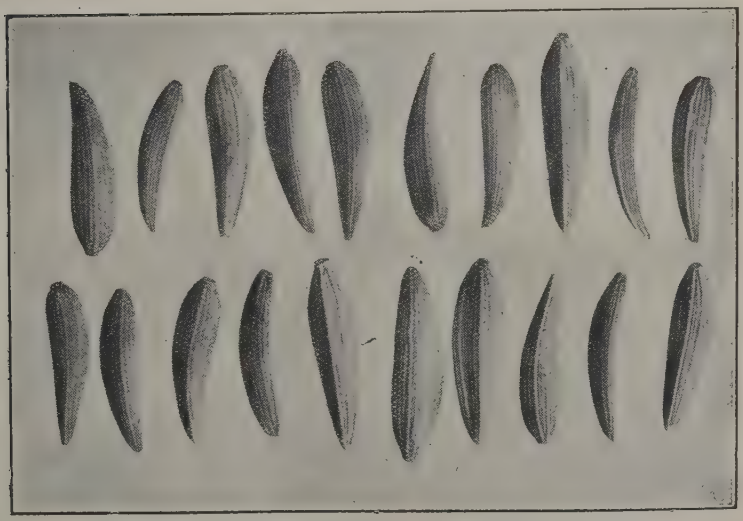
NIPPLEWORT.

Size: Average length, $\frac{2}{11}$ in.; average width, $\frac{1}{24}$ in.

Colour: Light to a fairly dark straw colour. The surface is smooth and fairly shiny.

Shape: The seed is oblong, distinctly curved, and flattened. On each edge is a ridge, and on each side seven to nine ridges extending from the base to the apex. The edge and the middle ridges are the most pronounced. The curvature is in the flattened side and not in the edge, so that the seed when at rest is lying on the middle of its side with two ends cocked up. The seed is pointed at the base and bluntly pointed at the apex. A very small crown is present.

FIELD SOWTHISTLE (SONCHUS ARVENSIS). ENLARGED 6 DIAMETERS.



NIPPLEWORT (LAPSANA COMMUNIS). ENLARGED 6 DIAMETERS.

The following table, compiled from analyses made in the laboratory, shows the relative frequency of occurrence of these seven seeds in the main agricultural seeds :—

Agricultural Seed in which found.	Of 100 Samples examined—						
	Californian Thistle was noted in	Spear-thistle was noted in	Winged Thistle was noted in	Common Sow-thistle was noted in	Prickly Sow-thistle was noted in	Field Sow-thistle was noted in	Nipplewort was noted in
Perennial rye-grass	*	2	..	..	1	..	..
Italian rye-grass	†	1	..	..	4	..	..
Cocksfoot	..	†	..	14	20	..	..
Crested dogstail	2	2	..	11	52	..	4
Chewing's fescue	..	1	..	..	..	..	..
Timothy	10	1	..	3	7	3	5
Meadow-foxtail	..	..	..	5	16	..	..
Fiorin	..	..	..	..	..	..	..
Poa pratensis	2	..	..	..	8	..	..
White clover	2	1	..	1	3	..	1
Alsike	12	..	..	..	2	3	..
Cow-grass	1	9	..	..	1	..	..
Red clover	4	14	..	..	..	..	..
Lucerne	..	17	..	4	1	..	..
Lotus	..	..	..	..	3	..	..

* Found twice only in the whole of the perennial rye-grass samples examined in the laboratory.
† Found once only in the whole of the Italian rye-grass samples examined in the laboratory.

Californian thistle was noted also in *Poa trivialis*, oats, and wheat.

Spear-thistle was noted also in canary-grass and oats.

Winged thistle was noted in danthonia.

Common sowthistle was noted also in Yorkshire fog.

Prickly sowthistle was noted also in Western Wolths rye-grass, canary-grass, tall fescue, carrot, *Poa trivialis*, Yorkshire fog, and yarrow.

Field sowthistle was noted also in *Poa trivialis*.

Nipplewort was noted also in Western Wolths rye-grass, meadow-fescue, and Bokhara clover.

SILVER-BEET.

W. J. McCULLOCH.

A CO-OPERATIVE field experiment in silver-beet (two varieties) has been conducted by Mr. H. Hartnell, Canal Reserve, Woolston, Christchurch. The first cutting gave the highest record of any single cutting in the history of this fodder plant, which goes to show that the reputation of silver-beet as a heavy yielder is well merited. In this case the seed was sown on the flat in drills 21 in. apart on the 3rd October last, and the results taken on the 24th February gave the following yields: Light-green variety, 79·63 tons per acre; dark-green variety, 58·65 tons per acre.

CATECHISM OF PRACTICAL AGRICULTURE.

CONTINUED.

PRIMROSE McCONNELL.

128. *Is a cereal the best crop to follow pasture?*

If the pasture is old and tough it is better to follow with a potato, swede, or rape crop, but not when the land is under a comparatively short rotation.

129. *In a cropping rotation, what is the main object in growing a potato, swede, or other fallow crop, apart from the food it provides?*

One of the main objects of growing such a crop is to clean the land.

130. *Under a cropping rotation, when should the fallow crop be sown?*

As a rule a fallow crop should follow a cereal crop, or should be at the end of the rotation, and just before sowing down with grasses and clovers again.

131. *What other desirable effect has this system besides cleaning the land?*

Such fallow crops as swedes, turnips, rape, &c., are, as a rule, fed on the land, and the resulting manure benefits the coming pasture.

132. *What time of year would you preferably plough a pasture for a swede crop?*

In autumn or early winter.

133. *How would you proceed after ploughing as directed in the answer to question No. 83?*

If ploughed in the autumn, a catch-crop such as mustard may be sown for ploughing under, and this is a very desirable course if the pasture is poor.

134. *At what stage and at what depth should the mustard be ploughed under?*

It should be ploughed under just when coming into flower, and to a depth of 6 in.

135. *Will lime be beneficial at this stage? Give reason for reply.*

Yes; because the ploughed-under mustard creates acidity which an application of lime corrects.

136. *When should the lime be applied?*

When the mustard is sown.

137. *How long should the ploughed-under mustard lie undisturbed?*

For at least six weeks.

138. *After allowing the ploughed-under mustard to lie undisturbed for six weeks, what is the next process?*

The land should again be ploughed.

139. *On this occasion should the ploughing be shallow or deep?*

It should be at least an inch deeper than the previous ploughing.

140. *Why should the ploughing be deeper on this occasion?*

Because the lime was previously ploughed under with the mustard, and it is necessary to bring them both to the surface again, and the deeper ploughing will be beneficial to the crop in other directions.

141. *Why is it beneficial to bring the lime and manure near to the surface again?*

Because lime, being easily washed into the subsoil, should never be ploughed under and allowed to remain so, except for a very short time, and the green manure is more beneficial when thoroughly incorporated with the surface soil.

142. *When a green-manuring catch-crop is not sown, should the initial ploughing be deep?*

Yes, if done with the digger.

143. *In this case will another ploughing be necessary?*

Another ploughing will undoubtedly be very beneficial, but it is not imperative.

144. *After the ploughing is completed, what is the next step in preparing for the swede or turnip crop?*

When no green manure has been ploughed under, the land should be repeatedly stirred with a cultivator.

145. *In the event of green manure being ploughed under, and again turned up close to the surface, what is the best implement to use?*

A strong disk harrow, because it incorporates the manure thoroughly with the soil.

146. *What is the next process?*

The land should be brought to as fine a tilth as possible with the disk and tine harrows, and finally rolled just before drilling.

147. *On what date should swedes be sown?*

Swedes may be sown any time between the end of November and the New Year.

148. *Should the sowing of turnips be confined to the same period?*

Soft turnips may be sown any time between October and February.

149. *Can the swede and turnip crops be successfully grown after any other farm crop?*

Yes; but swede should not follow swede, or turnip follow turnip, except on very rare occasions.

150. *What usually follows when these crops are grown for several years in succession on the same land?*

Diseases gradually make their appearance, particularly those of a fungoid nature, and the manuring becomes more costly.

151. *Should the swede or turnip seed be sown broadcast, or in rows sufficiently far apart to admit of after-cultivation?*

When such crops are grown in small areas the best results are had when the rows are sufficiently far apart to admit of after-cultivation, but on many large holdings, particularly those of a rough nature, this is impossible.

152. *In intensive farming, and when grown in small areas, will it pay to single the turnips with the hand-hoe? Give reason for reply.*

Yes; because, as previously stated, such crops are intended to clean the land as well as provide desirable food, and if kept thoroughly clean the beneficial effect will be apparent through the whole cropping rotation.

153. *How much swede or turnip seed should be sown per acre?*

Swedes, broadcasted through all the coulters of the drill, 9 oz.; turnips, 6 oz.; either, sown in rows about 26 in. apart, 2 lb.

154. *What is the best implement for sowing the above on the latter system?*

The double-ridger, which makes two rows and sows seed and manure in one operation.

155. *Give a good manure or mixture for the swede or turnip crop.*

Four parts basic superphosphate to one of bonedust.

WORK FOR THE COMING MONTH.

NEW ZEALAND is a country of wide variation in climatic and soil conditions. In applying suggested procedure it is, therefore, necessary for the farmer to amend it to suit local weather-conditions and the requirements of his soil—information which can best be ascertained by a study of these problems on the part of the farmer himself. Nothing can take the place of local knowledge. Little advice on an agricultural subject is capable of general application in its entirety.

THE FARM.

PRIMROSE McCONNELL.

WE have now entered into the early lambing season, and there is no branch of farming which has greater possibilities if undertaken on right lines. The ewes should be in good condition at lambing-time, and a plentiful supply of feed should then be available in order to ensure a good supply of milk for the young lambs. The best results cannot be obtained if the lambs receive a check at any stage of their life. Preparations should also be made for ensuring an abundance of succulent fodder when the lambs are weaned, and for this purpose nothing excels rape. If the lambs are in a forward condition at weaning-time, three weeks on good rape will make them prime fat.

It should be the aim of all fat-lamb raisers to get them off their hands as early as possible, and a little extra outlay to attain this end will yield a handsome return. The price now offered for fat lambs is just double that of six years ago, and this fact should encourage farmers to give this profitable industry every possible care. For flushing the milk just at lambing nothing is better than mangels, and a small area should be grown wherever possible. Of course, I am referring to fat-lamb raising on intensive lines, as I quite realize that on large holdings, and particularly on rough country, the same attention cannot be given as is possible on comparatively small farms.

The lambing-paddock should be near the homestead, so that the flock will be continually under the eyes of the shepherd.

The lambed ewes should be separated from the others as soon as possible, as it saves the attendant much trouble later on. Many lambs are lost through sheer carelessness, and when we

remember that each may be worth £1, it should surely serve as a stimulus to better attention. It occasionally happens that a ewe requires assistance in lambing, but this should only be given after the shepherd is convinced that it is really required. When parturition is prolonged, the ewe should be caught and examined, and if the delay is caused by the lamb presenting itself in a wrong position, help is imperative. Ewes in lambing a large single lamb, particularly those in lamb to a Lincoln ram, often become exhausted by the time that the head of the lamb is ejected, and, being unable for a short time to make a further effort, the lamb is often strangled if the attendant is not on the outlook. The shepherd should keep his nails cut as short as possible, and, before operating, his hands and arms should be washed in an antiseptic solution, the ewe being washed out with a similar solution after the operation. Strong, fit ewes require much less attention than those in low condition. The weak ewe will often forsake her lamb, but this rarely happens when the ewe is strong and has a good supply of milk. The "mothering" of orphan lambs is an art in itself, and one which is not much practised in New Zealand. If the lamb is rubbed with the effluent that is the result of parturition the task is an easy one. In this case, if the orphan is a few days old and very strong, its legs should be tied before placing it in front of the ewe, her own lamb being kept in the background, until she has licked the orphan well over, otherwise her suspicions may be aroused. If a lamb dies, it should be skinned at once and the skin fastened on the orphan. When this is done the ewe, as a rule, will take to it at once. For mothering purposes, or for sheltering weakly lambs for a day or two, it is well to have a few pens in the lambing-paddock. These may be made of three or four hurdles covered with straw and the sides closed in with sacking.

All dirty ewes should be dagged, but when the flock is small the writer is of opinion the ewes should not be crutched in the orthodox fashion, as it exposes a tender part of the body during the coldest season of the year, and at a time when it particularly requires protection. In the event of a death the ewe or lamb should be buried at once, as nothing looks worse than unburied carcases lying over the farm, apart from the danger of spreading disease.

Where there is a pig herd—and this should be a branch of every up-to-date farm—the owner should always arrange that a few sows will farrow about the end of the month, or just when the milk-supply is beginning to be abundant. If possible, each sow should be separated as she comes to her time of farrowing,

and if a house of some sort is available for a short time it is undoubtedly an advantage, although elaborate housing is not by any means necessary to ensure success. A few roomy huts on runners will serve the purpose.

Generally speaking, the farrowing sow is better left severely alone. It is a time when personal attention may be almost omitted. For a few days previous to, and a few days after, farrowing the food given to the sow should be of a very sloppy nature, and nothing is better than bran. Very often there is one pig in the litter that is much weaker than the others, and as a rule it is better destroyed. On a dairy farm, milk will, of course, be the staple food during the milking season; but in the case of a sow nursing a litter, or for young pigs newly weaned, the addition of a little barleymeal is excellent. Every pig-breeder should endeavour to build up a good pedigree herd, and this may be accomplished with a comparatively small outlay. A pig of the wrong type never pays for its keep, and, as a matter of fact, it costs considerably more to fatten than one of the right stamp.

The busy season in the dairy herd is again commencing. It should be the aim of every farmer to improve his herd by the purchase of a pedigree bull from a herd of undeniable milking-qualities, and this should be seen to as soon as possible. Many farmers say that they cannot afford such a luxury. The writer's opinion is that they cannot afford to use a scrub bull, no matter how cheap. It is unwise, however, to purchase a bull simply because he has a pedigree of pure breeding; he must also have a pedigree of performance.

In breaking in the young dairy heifer successfully, gentleness is the main essential, and when milking is done by hand the leg-rope should be avoided as much as possible. Many cows are exceedingly high-strung, and a very little upsets them; but such cows are often great producers, and are extremely gentle when treated properly. On the other hand, when they are abused they make a very poor record, and are thought of little value.

Ploughing for spring crops should be pushed forward at every opportunity, also oat-sowing. Paddocks should be ploughed as close to the fences as possible. A few yards adjoining the fence left untouched year after year forms an ideal shelter for all manner of parasites and weeds, and also takes away from the general good appearance of the farm.

If weather-conditions are favourable, sowing of spring wheat may be commenced by the end of the month, and on comparatively dry soils such crops as tares, Western Wolths, barley, and rye may be sown during any part of the winter or spring.

The chain-harrowing of pastures should not be neglected on any account, the value of many pastures being discounted by its omission. Mangel and carrot storing still undone should be completed at once.

THE ORCHARD.

J. A. CAMPBELL.

As previously stated, there is a lot of very important work to do in the orchard during the dormant season which cannot be done at any other time, and the weather is always precarious. Therefore every advantage should be taken of all the fine weather in pushing along with the work. Pruning, cleaning up, and spraying are cold and dirty jobs at the best, but more particularly is this the case if the work has to be carried out in wet or dirty weather over ploughed or muddy ground. Such conditions are often made necessary in order to finish up in time through failing to take full advantage of the better weather-conditions existing earlier in the season. Besides, fruit-trees should only be sprayed while they are dry, otherwise the water on the tree will weaken the mixture, often to such an extent as to render it more or less useless for the purpose for which it is being applied.

In connection with winter spraying I wish again to point out that the work must be thoroughly done. The spray should be well driven into the crevices of the bark, branches, buds, &c., by using a high pressure. The whole of the tree should be thoroughly covered, including the tips of the branches, and always remembering that if any part of the tree is more important than another it is the new wood. This wood, being more soft and succulent, is more enticing to sucking insects than the older wood and suffers more readily from their attacks.

SPRAYING.

This is the month usually selected for the application of oil sprays, as the trees are now in a dormant state, and a stronger mixture can with more safety be used. Oil for spraying can be emulsified as directed in the Department's spraying-leaflet, but as there are several reliable brands of prepared oils now on the market this method is seldom adopted.

Spraying should be carried out as follows:—

Peach and Nectarine.—For the control of red mite and San Jose scale, early varieties should be sprayed with oil 1–20, and other

varieties 1–17. Lime-sulphur may be used 1–15 to control San Jose scale in all varieties.

Other Stone-fruits.—Oil 1–17 should be used for the control of red mite, mussel scale, and San Jose scale. Lime-sulphur 1–15 may be used in the case of San Jose scale with equal effect. Practically the whole of the Japanese varieties of plums are liable to the attacks of the disease known as plum-pocket or bladder-plum, and, as several of them blossom by the end of July, they should be sprayed with the winter formula of the Bordeaux mixture just as the buds begin to swell.

Pip-fruits.—Mealy bug, red mite, mussel scale, and woolly aphis should be controlled with oil 1–15. If the trees are badly affected with mussel scale, oil 1–12 should be used. San Jose scale requires the application of oil 1–15, or lime-sulphur 1–12.

The lime-sulphur referred to is any of the brands of commercial lime-sulphur registering a 33 Beaume test.

PLANTING.

The month of July is not considered to be the ideal month for planting fruit-trees in most parts of New Zealand, although this does not always apply. In cases of well-drained friable soils, if the weather is at all fine, trees can be planted more or less throughout, particularly toward the end of the month; but, generally speaking, the soil is too wet and cold for successful planting. The condition of the soil should always be the guide. Never plant when the soil is wet and cold. On the other hand, never postpone planting when the conditions are suitable, as they may be worse later on. Prior to planting, the young trees should be dipped as given in last month's notes. If the planting is not being done till toward the end of the month they should be again dipped in the winter formula of the Bordeaux mixture. Trees coming to hand when the soil or other conditions are not suited to planting should be heeled in in such a way as to keep their roots moist and protected from the winds and frost.

PRUNING.

There are still some growers who are altogether opposed to pruning, particularly to systematic pruning carried out for the purpose of shaping and training the tree, arguing that trees will come into bearing earlier, and will bear heavier crops, and make altogether better trees if left to themselves and not hacked about every year in the form of pruning.

"Hacking about" is somewhat of a reflection on scientific pruning, and if it is the best that can be done there is no doubt the

trees would be better left alone. As for coming into bearing earlier, the trouble is that most of our trees come into bearing and are allowed to bear far too early, greatly to their detriment.

Certain articles have been appearing recently giving the actual results of experiments over ten years covering heavily pruned, lightly pruned, and unpruned trees. In this the largest and altogether most satisfactory trees were those that were not pruned, next in order were the lightly pruned trees, whilst the trees that made the least amount of growth and were otherwise the least satisfactory were those that were heavily pruned.

These results are certainly peculiar, but to fully understand the reason of them local conditions would have to be thoroughly understood. One thing is certain, the same does not apply in this country. The above results, at least as far as growth is concerned, are quite contrary to thousands of experiments carried out both intentionally and unintentionally in practically every fruitgrowing district in New Zealand.

Under favourable conditions, such as good soil, an even and plentiful rainfall, thorough cultivation, proper spraying methods, &c., unpruned trees will grow large and bear heavy crops of fruit. Where such conditions exist, although they improve the chances of the unpruned tree, they do not lessen the advantages to be gained by proper pruning and training. Unpruned trees grown under the most favourable conditions have still many disadvantages. Heavy crops of undersized, badly coloured fruit; the annual breaking-down of branches (unless an elaborate system of propping and tying up is adhered to); difficulty in spraying and picking; the gradual exhaustion of spurs and fruiting-wood in the lower portion of the tree through the lack of light caused by the density of the branches; the difficulty of thinning the fruit, which if not carried out systematically every year will result in the tree soon becoming a second-year bearer, all point to the necessity of pruning. Unpruned trees grown under average conditions, and including the weaker-growing varieties, must eventually result in dissatisfaction to the grower. Such trees at ten years old, instead of being fairly large and healthy and in practically full bearing, are often small and bark-bound and very much on the decline, and, although bearing a heavy crop of fruit, this is usually little more than rubbish. Even if thinned it would scarcely reach normal size. Further, the fruit-bearing surface of the tree is such that only a small quantity of fruit could possibly be gathered.

Scientific pruning and training of fruit-trees has become a recognized necessity throughout the fruitgrowing world, particularly where quality rather than quantity is the aim of the grower. On

the other hand, pruning does not necessarily make a tree bear fruit, but it does result in the fruit being eventually borne on that part of the tree where it is most desired. Other conditions being favourable, heavy winter pruning will result in strong growth, which, if properly handled, forms the base on which to shape the tree. If strong growth does not follow hard winter pruning, there are other conditions working against the tree, such as damaged or faulty roots, bad drainage, or the absence of sufficient moisture through drought or bad cultivation, &c.

Strong growth, and therefore more or less hard pruning, is required for the first two or three years in order to build up a strong framework as the foundation of a large tree. I say "large" as I am a believer in large trees so long as they are properly trained and have fruit-bearing wood low down.

After the tree is properly set the pruning becomes less and less severe until the tree settles down into bearing, after which the health as shown by the growth made is the best guide as to the amount of pruning required, always remembering that in a matured tree the weaker the growth the heavier the pruning required.

In a well-trained tree ample provision is always made for the admission of air and light, necessary for maturing both fruit and foliage. The centre is open and the limbs well spaced. Such trees are more easily pruned and sprayed and bear more regularly. The fruit is more easily thinned and gathered, and it matures and colours better than on the best of unpruned trees.

Pruning is a very important matter in connection with the future welfare of the orchard, and now is the time for the work to be done. Prune your trees according to their age and the amount of growth they have made as indicated above.

ROOT-FUNGUS.

Root-fungus affects fruit-trees in many different localities, particularly in fern country or where scrub or other wood growth has been ploughed under. Trees are often badly affected before the trouble is noticed, and it is then difficult to effect a cure; but once having experienced the disease it is much easier to pick out the sick trees. Treat affected trees by removing the soil from around the roots and cutting the affected part well away, washing them with a strong mixture of Bordeaux. Apply to the soil from 3 lb. to 5 lb. of sulphate of iron and prune the tree hard back. The surrounding trees should as a preventive receive an application of 2 lb. of sulphate of iron to each tree.

THE POULTRY-YARD.

F. C. BROWN.

TOPICAL PROBLEMS.

If the breeding-birds have not been already chosen, no time should be lost in mating up the parents of next season's stock. The month of July is an admirable time in which to hatch the heavier breeds, and, be it always remembered, the early chicken is invariably the most profitable, for it is bred at a time when it has to be protected from harsh weather, and passes through its most critical stage of development before the advent of the hot and trying summer months. It should be unnecessary to emphasize again the vital importance of choosing a sire of undoubted constitutional vigour, and, where eggs are the objective, he should be descended from a strain of heavy layers. The sire is more than half the flock. While the hens for the breeding-pen should be as good as possible, no care is too great in selecting the male bird. His constitution should be exceptional if his daughters are to develop strongly without check, if they are to escape disease, and if they are to lay well right to the end of the season. I have seen birds built like layers but which had proved unprofitable, and when I saw the father of them I did not wonder at it. Feminine characters should only be looked for in a female. The sire should be practically the other extreme, though coarseness is not necessarily an indication of stamina. He should proclaim constitution in every part of him, and, while having the necessary weight, should possess a certain degree of refinement, of which a fine texture and good flat bone are fairly accurate signs. He should, too, be active and of striking carriage. The other points in his make-up — such as bold eye, clean face, broad saddle, legs well apart, and tight feathering—should be well enough understood; indeed, given the essentials first described, the minor points will necessarily follow. It is taken for granted that only purebred birds are used in the breeding-pen. Even under the most favoured circumstances it is not always possible to secure the desired stock or birds of a type which might be naturally expected from a particular breeding-pen, but the disappointments are multiplied when cross-breeding is resorted to. I admit a first cross is often productive of very satisfactory laying-stock, but if these grades are bred from, disappointment is bound to be experienced. Of course, having the stock pure is not everything. A case came under my notice the other day where some rather inferior stock had come from some good hens mated with a most attractive male bird. On inquiry I discovered that the latter was the one good result of some rather

indifferent parents. This experience is common. I would always prefer a rather indifferent stock-bird from high-grade parents than a fine bird from poor parents. The former will probably impart to its progeny his good family qualities, while the latter will most likely beget throwbacks to his weak ancestors.

The management of the breeding-pens is a matter which demands much greater care than is usually given to it. It is a mistake to put too many hens with the rooster, just as it is a mistake to put too few. In closely confined quarters not more than eight hens of the heavier breeds should be put with the male bird, and ten hens of lighter breeds. On free range, which is most desirable for breeding-stock, these proportions of hens may be doubled. A common mistake is to place the rooster with the hens just before the eggs are required for incubation. The birds should be well settled down before the incubation period.

The diet is a most important item in breeding operations. While the birds should not be fed a forcing ration, they should have an ample supply of nourishing food, which should not lack in variety. Only the best of grain should be used, and green stuff and grit should be plentifully supplied. The object to aim at is to keep the birds in the very best condition, active, and vigorous, and the breeder's own judgment should enable him to do this.

Much of the ill success met with in incubation, brooding, and rearing may be traced to mistakes made in the management of the breeding-pen. For instance, the dead-in-the-shell trouble is invariably due to a weak germ which has not the strength to successfully make the final effort, and the weak germ is, of course, decided in the breeding-pen.

THE APIARY.

F. A. JACOBSEN.

THE work of the apiary having been completed for the season, nothing remains to be done in handling bees. Work at this time of the year must be confined to preparing hives, foundation, and other accessories of this kind for use during the coming summer.

THINGS TO REMEMBER.

Do not let your colonies starve during the winter months.

Remove damp mats from the top of the frames when necessary, substituting dry ones.

Do not break the cluster of bees at this period of the year by removing combs from the hives for examination.

Do not feed honey from a doubtful source, as it may contain germs of disease (foul-brood).

ANALYSIS OF HONEY-SCUM.

MR. F. A. JACOBSEN, Apiary Instructor, in reading a paper before the Conference of the National Beekeepers' Association, gave the analysis of a sample of 4 lb. of so-called scum as follows: Water, 17·90 per cent.; dextrose, 41·70 per cent.; levulose, 38·50 per cent.; sucrose, 1·10 per cent.; dextrin, 0·16 per cent.; ash, 0·14 per cent.; acid expressed as formic, 0·05 per cent.; undetermined, 0·45 per cent.

The Conference considered this most satisfactory and valuable information, as it illustrated that one kind of scum is practically pure honey.

THE GARDEN.

W. H. TAYLOR.

VEGETABLE-CULTURE.

YOUNG *cabbages* and *cauliflowers* from seed sown at the end of March or early in April should now be ready to plant out. If the plants were pricked off into nurse-beds so much the better. It is quite usual for a percentage of the plants to run to flower. The period of danger is when spring is awakening. At that time there is a tendency on the part of many things to run to flower. It is then that carrots and parsnips, and also turnips and spinach, bolt. The percentage of bolting plants may be lowered by good treatment. It is imperative that the plants be young. The time mentioned for sowing — namely, the last week in March or the first week in April — is the date accepted as best, being as early as is safe to prevent bolting, and as late as will give time for the necessary growth. The soil should be in good condition, well worked to a good tilth, so that what warmth the sun can give may readily penetrate, and that rain may sink freely and not hang about in the surface soil. For this reason it is worth while to take measures to loosen up footmarks after planting. If the plants were pricked out they will lift with a good bunch of roots, and will hardly feel the shift if properly planted. They should not be planted with a dibber, for, except in the best of soils, this makes a hole with plastered sides, out of which the roots do not strike freely. A short-handled hoe is the best implement to plant with. Drive the hoe into the soil and give a pull to open up a space beyond it. Put the roots in behind the hoe and draw it out, and the soil will fall on the roots. Give a smart dab with the head of the hoe to the loose soil; that will make it sufficiently firm. Spring cabbages are usually cut young, so do not require a large amount of space. If the soil is good they may be planted in rows a little under 2 ft. apart, and 18 in. apart in the rows.

It is quite worth while to plant a good area, for they come at a time when vegetables are scarce and also when young cabbages are in strong demand. They are sure to be drawn from before they are fully grown, and a small supply will soon be exhausted. Moreover, this planting has an additional value in that cut heads quickly form sprouts. This planting is the only one throughout the season that can be said to produce valuable sprouts, and for that reason the stumps should be left in the ground. Sprouts come very quickly. They become large enough for use in four or five weeks after the head is cut, but increase in size, and consequently in value, if left longer. They will form good solid heads if thinned to three or four on a stump. The sprouts are much better eating than the first head, the flavour being mild and sweet. In a private garden these sprouting plants will be appreciated, and by taking proper care of the ground — that is, by hoeing it up occasionally — there is no need for the planting of more cabbages till the winter supply is put out. That is to say, two plantings will circle the year with their produce. Such was, in fact, my own practice for many years while catering for private families.

Cauliflowers. — These are a summer vegetable. The so-called cauliflowers now in use are broccoli. I mention this because there is some misunderstanding, as shown by correspondence received. Calling them cauliflowers in the market does not matter much, but they certainly cannot be grown from cauliflower-seed. Roughly speaking, and allowing that there is some difference of season in various parts of the Dominion, the variance is not much. Cauliflowers may be had from October to June. During the winter and early spring months broccoli fill their place. The broccoli can be extended to December by growing late sorts, a thing not necessary in the home garden if spring cauliflowers are grown. Cauliflowers are of two types. One produces medium-sized heads in a short time, the other larger heads after a longer period of growth. Two specimens of the first type are Snowball and Early London. These varieties come in first. They are usually in season from late in October till the end of December, or nearly so. This is the type that is liable to button prematurely, for which reason good cultivation is necessary to ensure success. Good cultivation does not mean heavy feeding, but, rather, intelligent handling of the plants and proper working of the soil. In other words, giving the plants the treatment necessary to keep them growing. It is a check that causes them to bolt. Cauliflowers require more room than cabbages. Give the earlies a space of 24 in. by 30 in. The second type take longer to come in and are larger. Plant at the same time, and expect

the first heads about Christmas-time. Plant them in rows 3 ft. apart and 2½ ft. asunder in the rows. Veitch's Autumn Giant, Metropole, and Early Erfurt are of this type.

Lettuces planted now supply the best heads of the season. The cabbage varieties are the only ones that do well in our climate. The cos varieties make merely a bunch of rough leaves with no crisp, solid heart, such as the cabbage kinds give us. Lettuces are not economically grown in long lines. The handiest way is to use a strip of ground alongside a path as a border. Mark off a strip—say, 10 ft. wide—and let the rows run at right angles with the path. The advantage in working is very considerable. When a bed is finished it is a small and compact plot that is vacant, and this is easily refilled with a further generation of lettuces, or with radishes, spinach, or turnips, all of which require frequent renewal through the summer. As soon as a head or two are cut, the stumps may be pulled out and a young plant, or a seed or two, put in. Thus one bed may be made perpetual for the season. A little fresh soil from the compost-heap, a little well-decayed manure, or some artificial fertilizer will keep the soil in good heart. The narrow border is also a convenient place for raising the various plants that are required—cabbages, &c. The position is always handy. A few seeds can be sown without being in the way of other things, and as they are by the side of the path they are always under observation.

Shallots, garlic, and *chives,* if grown, are also conveniently placed there. Shallots and garlic may be planted now. The accepted plan is to plant on the shortest day, harvesting on the longest. This is of some importance. In favoured districts planting may be done at the end of spring, and they will do well, but in dry places they fail unless planted in the rainy season. Shallots and garlic should be planted in rows wide enough apart for hoeing, and about 10 in. from set to set. The soil should be worked to a fine state. Give a dressing of wood-ashes or soot, or both. The sets should be pressed into the soil so as to just cover them. Chives are useful at all times for flavouring or salading. The tops may be cut for use, and they will sprout up again as often as they are cut. For planting, break up the clumps into as many pieces as they will make if the stock is short, but plant larger pieces if much increase is not required.

July is the beginning of spring in the vegetable-garden, inasmuch as seed-sowing is then actively taken up. The extent of operations, of course, depends on local conditions, and I have not experience of all parts of the Dominion. In most places *peas* will be sown in quantity. These are no longer a chance crop. Those sown early in the season are always the best. Peas like moisture

and only a moderate amount of heat. In some parts only early-maturing crops can be grown. In others, where rainfall is plentiful and cooler conditions prevail, they come in succession till the end of March, the last sowing being made early in January; but always the lots sown prior to October are the best. The heaviest crop usually are from those sown in July. At the first sowing two kinds should be put in, a dwarf for first use and a taller variety to succeed them. Both should be sown the same day. I have found it to be unwise to suggest varieties.

Broad beans should be sown if not yet in, but if a sowing has been made, postpone the next till September. Seeds to sow include cabbage, cauliflower, lettuce, radish, onion, carrot, and spinach. Turnips should not be sown till August. They go to seed if sown before that time.

Onions sown in autumn should be transplanted as soon as the soil is in a fit state. As to whether it is imperative to transplant onions depends mainly on two things. If a giant kind is being grown, transplanting is necessary, otherwise they go to seed, and in addition they require freshly worked ground or they will not do their best. In regard to keeping-varieties, it is best that these be also transplanted or they will not keep. The circumstance to determine whether they be transplanted or not is whether or no it is desired to keep them long. When transplanting, care must be taken not to bury the bulb, for if put in deep they will develop thick necks. The roots only should be buried. This may be accomplished by making very shallow drills. Draw the earth out so as to form a ridge on one side only of the drill, and let the young plants recline against the ridge with the roots in the drill. Draw in just enough soil to cover the roots. The plants will grow erect in a short time, and cultivation will level the ridges. Soot and wood-ashes are good fertilizers, and should be applied. A little later basic slag, 2 oz. to the square yard, may be given, and nitrate of soda at the same rate.

Parsnips should be sown early in dry districts. They will get no size unless they have got their roots well down before dry, hot weather sets in. In places where there is a fair rainfall, if sown early, they become coarse before winter. Mid-September is quite early enough in such circumstances, and where there is extra quick growth, as in the rich moist land in the Manawatu, the first week in November is the best time to sow for winter use.

Cucumbers may be sown on hotbeds if the plants are to be grown in frames.

Herbs of all kinds may be planted or seed sown. *Mint* should not be deeply planted, though just what should be done

depends on the condition of the clumps to be drawn from. Old patches have a habit of forming a sort of turf of matted roots, and pieces taken from them would be likely to die if planted in the ordinary way. Lay them on the surface, pat them down firmly with a spade, and sprinkle a little soil over them. *Thyme, sage, marjoram,* and *winter savoury* become worn after several years. They may be renewed by division if many plants are wanted, but by seed is the easiest way.

SMALL FRUIT.

All pruning should be done forthwith.

Gooseberries.—The main branches should be thinly disposed so as to maintain a fairly open bush. There is nothing gained by crowding, for when light is excluded from the centre such parts become barren. Try to build an upright bush, somewhat cup-shaped, with a hollow centre. Spur back the bushes in the lower parts, but merely tip them higher up. Spray with 10–10–40 Bordeaux for suppression of leaf-spot.

Red and White Currants.—These bear only on spurs two years old or more, and on these for an indefinite number of years. The encouragement of these spurs should be the object of the pruner. Light and air is a great necessity, so an open bush should be sought. On no account allow the bush to stool; have one stem only. Begin with four branches and shorten leaders each year to 10 in. or 12 in. according to strength. Leaders are duplicated each year. An ultimate height of 4 ft. is sufficient. The leaders should form the frame of a cup-shaped bush. Treatment of lateral growths during summer was advised at the proper time. The laterals should have been shortened to about 6 in. in summer, and they should now be reduced to short spurs, $\frac{3}{4}$ in. or 1 in. long. A bush will now look rather curious, but will be in correct form to produce a maximum of fruit. A moderately good bush should bear from 12 lb. to 15 lb. of fruit. These weights were borne by bushes under my charge at the Weraroa Experimental Farm. Good varieties are La Versaillaise, Cherry Red, Bertyn's No. 9, Chenanceaux, and Fay's Prolific.

Black Currants.—Black currants require quite different treatment from the red. They bear on young wood as well as on spurs. There is a tendency for the bushes to degenerate rapidly, and they are also much affected by the borer. These facts make the forming of a shaped bush inadvisable; at least, this is what my experience has been. It is desirable to cause the bush to grow vigorously, and to frequently renew it by cutting out old branches in favour of new. By this means the borer is defeated, because the branches are not left long enough for it to kill them. The bushes should be allowed to stool—that is, throw up shoots

from beneath the surface—for it is these that are to furnish the branches for renewal. Pruning mainly consists of thinning to prevent crowding and to allow of the necessary light, also a slight shortening of young shoots. On naturally dry ground the growing of black currants should not be attempted. They require a strong and moist soil. Kentish Hero and Champion are the only varieties I can vouch for from my own knowledge.

Raspberries.—Cut out all dead canes, and reduce live canes to six at most. Remove about one-fourth of their length.

Loganberries.—Remove the old bearing-wood entirely and lay in young rods. In case there are not sufficient young rods, the bearing laterals on the old rods may be cut back to about 1 in. They fruit freely the second year, but apparently will not fruit a third time.

THE FLOWER-GARDEN.

Roses.—It is high time to finish planting roses. They can be planted long after this time, but that should be regarded as a matter of expedience, and not as good for the roses. The bushes should now be pruned before being planted, for the proper time for pruning has arrived, and it is obviously more convenient to prune before planting than after. The growths should be cut well down. It is not a sacrifice to cut every branch back to one or two buds, but rather it is a gain. Hard pruning ensures strong growth, while, on the other hand, mere shortening is sure to result in a weak growth. At the same time very weak shoots should be cut right out. Occasionally extra-strong plants are received, and in this case it may be permissible not to shorten quite so much. It is, however, dangerous to advise this, as such advice is likely to be too widely applied. All roots should be recut with sharp seccateurs. Bruised roots decay back for some distance, seriously hindering the formation of new roots. Rose-bushes established in the garden sometimes become too luxuriant and fail to flower satisfactorily. This applies more particularly to hybrid perpetuals. The best remedy is to lift them. Cut out over-luxuriant shoots altogether, and also unripened shoots. If the bush is crowded, cut out a number of branches and all weak shoots, and also cut back leaders to about 6 in., and all lateral shoots to two buds. Cut all roots with sharp seccateurs. When planting be careful to plant in clean soil; manure should on no account be in contact with roots. After placing the roots of the bush in the hole prepared for it, fill about two-thirds with soil; give the bush a shake so as to get the soil well about the roots, then tread very firmly—it is difficult to tread too hard—and fill up with soil and leave it loose.

Pruning: Tea roses require the removal of old flowering-wood. When the branches become twiggy they give poor blooms. The

aim should be to conserve young growth, for strong young shoots give the best blooms. Shorten them only sufficiently to remove the unripened tips. Lateral shoots should be similarly shortened. The ends of the laterals are always thin. Cut back to a good bud. Remove all dead twigs and any young shoots that bear evidence of being immature. Hybrid perpetuals require more severe pruning. First cut away entirely weak growths from the centre and dead wood wherever it may be, and also gross unripe shoots that sometimes are found. Shorten leading branches to about 8 in., except very strong growers, which should be left a few inches longer. Shorten all side shoots to two buds, and cut the leaders to an outward bud, so that the new leaders may tend outward and not crowd the bush. Each bush should have one stem only coming from the ground. Those that have more are fit subjects for lifting, so that the surplus may be removed. I once inspected a patch of roses that had been severely pruned to make them flower more freely. They had become worse and worse, being at the time of my visit great masses of growth with an average of a dozen or more strong shoots coming from below the surface. These bushes were quite unmanageable. They were just a sample of splendid energy being wasted. With climbing roses the aim should be to keep these young by frequent removal of old wood. A proportion of young rods should be laid in each year, cutting out old ones to make room for them. In a general way there should be no wood more than two years old. During the first year the buds along the young rod will each develop a flowering spray. In the second year cut each of the side shoots back to two buds, and these will give flowers. Next winter cut the whole rod out. It can be arranged to renew half the bush each year. This plan is simple, besides being the best, and would do away with the puzzle that climbing roses often are when the young rods are cut out as useless and the old left year after year. There are some exceptions in the case of roses that do not readily conform to this plan, but so far as I know they are only old ones which are not worth dealing with. Roses of the Dorothy Perkins type should be thinned rather than cut back, but the straggling twigs may with advantage be trimmed in a bit. Banksia roses flower best on the young rods. These should be laid in wherever possible; indeed, they should be treated as advised for climbers. This is not the plan advised in English horticultural papers, but perhaps our climate effects a difference in the state of ripeness of the rods. In any case what I have advised is correct.

In places where the leaf-spot disease is troublesome it would be wise to spray the bushes while dormant with Bordeaux mixture 10–10–40 strength.

COMMERCIAL INTELLIGENCE.

COLONIAL HONEY EXHIBIT AT GROCERY EXHIBITION, ROYAL AGRICULTURAL HALL, LONDON.

THE Director of the Orchards, Gardens, and Apiaries Division, Department of Agriculture, Industries, and Commerce, Wellington, has on hand a number of schedules of prizes, with entry forms, for distribution amongst apiarists in the Dominion, for colonial honey to be exhibited at the Grocery, Provision, and Allied Trades' Exhibition in the Royal Agricultural Hall on the 18th to 24th September, 1915.

The High Commisisoner at London, in forwarding these, says, "It will be noticed that the entrance fee is only 2s. 6d., instead of 10s. charged last year at the Dairy Show, and that the exhibits to be entered are representative of an output of half a ton as against one of 5 tons. This should appeal to a large number of bee-farmers, and it is hoped that advantage will be taken of this opportunity of bringing New Zealand honey prominently under the notice of the grocery trade here as well as the large number of consumers who attend this interesting exhibition. In my opinion, a large entry would be a splendid advertisement, and helpful to the development of our honey trade in this country. Exhibits should be carefully packed and shipped not later than the middle of July, so as to make certain of arriving here in ample time."

Intending exhibitors should communicate with the Director of the Orchards, Gardens, and Apiaries Division as soon as possible.

CALIFORNIAN BUTTER-MARKET.

A NEW IMPORT REGULATION.

THE New Zealand Commissioner in America, Mr. E. Clifton, in forwarding a copy of the Act of the Senate of the State of California regulating the sale of manufactured food products, says,—

"In this it will be observed that it is enacted that all foreign butters that are offered for sale in this State must bear the words 'Imported Butter,' and also that the premises in which these are so offered are required to legibly indicate that such products are offered for sale or consumption. This, it is understood, met with some objection; curiously enough, from the dairymen. The larger section, however, desired this as a protection against the alleged injury to the domestic product by the introduction of the foreign article. It may be accepted, however, as decidedly advantageous to the products of our country. There is no doubt that a very considerable proportion of the butter introduced from New Zealand is sold here as Californian. Heretofore there has been no regulation in this respect. The same provision is being enacted in the State of Oregon."

BUTTER AND EGGS FROM SAN FRANCISCO.

MR. E. CLIFTON, New Zealand Commissioner at San Francisco, writing under date of 6th May, 1915, reports that during the latter part of the last week in April three large lots of butter cleared the Customhouse for shipment to Australian ports. The shipment amounted to 1,165 boxes. Another large lot had been contracted for to be shipped the first week in May, as well as a good-sized shipment of eggs.

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written only on one side of the paper.

APPLYING BURNED LIME.

W. S. BADGER, Ashhurst :—

Could you tell me whether 2 cwt. or 3 cwt. of burned lime would injure oats, or turnip and rape seed, if drilled with the seed in the same way as fertilizers? I know, of course, that the usual way is to sow the lime broadcast and work it into the land, and wish to try above way, but do not wish to do so if it would kill the seed.

The Fields and Experimental Farms Division :—

There would be a danger of injuring the germination of the seed, especially the fine seed, by drilling the burnt or caustic lime with it. With the carbonate of lime (finely ground limestone) this danger would be eliminated very largely. It would be much more satisfactory to either broadcast the lime and work it well through the soil, or make use of the carbonate of lime in the drill. The latter form of lime is specially suited to light soils deficient in humus, and it can be used in any quantity without injury to the soil. The carbonate is equivalent to about half the quantity of the burnt lime, hence allowance would have to be made accordingly.

CALF-REARING.—TARES.

A. H., Western Plain :—

In the *Journal* of the 20th March you say, "The fact that eighty calves have been reared at the Ruakura Farm of Instruction this season without death or illness is further proof of the value of the dry system of rearing." You might give a short account of the system, as I am sure it is what is wanted. I know it is what we want here. The 9 acres tares you mention I suppose were winter tares. What were they grown after, and what manure did they get?

The Fields and Experimental Farms Division :—

In the *Journal* for May, 1914, page 511, appears an article entitled "Feeding the Calf." A copy of this publication has been posted to you. The tares mentioned were Black Scotch winter tares. A crop of oats was harvested in February, and the field ploughed immediately after and sown in March with 1¼ bushels of tares and 2 bushels Russian barley per acre, grazed all the winter with sheep until the middle of September, then closed down for harvest.

LUCERNE.

"SUBSCRIBER," Temuka :—

I am about to grow lucerne. The ground was skim-ploughed out of grass last January and well worked, and deep-ploughed in April, and I am now going to give another good working, and plough it again in about a week's time. The soil is a good loam, about 2 ft. deep, resting on a shingle bottom, with the water about 10 ft. off. What quantity of lime would I require to put to the acre, and what manure and seed would I require? What is the best time to sow? Kindly give me any other information with regard to working and sowing, &c., so I can get a good strike.

The Fields and Experimental Farms Division :—

From the description of your land I should say it would grow lucerne admirably.

Apply finely ground carbonate of lime, at the rate of at least 1 ton per acre, as soon as possible, and apply basic slag, 3 cwt. per acre, and kainit, 1 cwt. per acre, at time of sowing seed. Procure Colonial or Marlborough seed, and sow 15 lb. to 20 lb. per acre. The best time to sow in your district would be the end of September or the beginning of October. I am sending you a bulletin on lucerne.

SLUGS.—BLACK APHIS.

"AMATEUR," Waikato :—

1. What is the best treatment for slugs in flowers and short-growing plants?
2. What is the best treatment for black aphis affecting the peach and nectarine trees?

The Orchards, Gardens, and Apiaries Division :—

Applications of soot or lime should keep slugs under control. This is best applied at night when they are on the move. The soil should be constantly stirred and the garden kept clear of weeds and rubbish of any sort which would provide a harbour for the insects.

McDougall's insecticide has given good results in controlling black aphis of the peach and nectarine (see spray leaflet forwarded you).

TROUBLE WITH COW.

"POLEY," Towai :—

I had a cow in low condition. She got bogged. I pulled her out and got her on her feet. She walked about half a mile after being pulled out of the bog, and had a feed. Next morning she was down. I fed her for three or four days. She would feed all right, but would not chew her cud. I gave her a drench of half a bottle raw linseed, also a drench of gruel and ground ginger. As she was practically moribund I killed her. In opening her up, in the first stomach I found a lot of parasites loose and adhering to the stomach. Those loose were coloured red, about ¾ in. extended, with the head the largest part. They were practically round, and tapered from head to tail. When not extended the parasites were egg-shaped. Those adhering to the stomach on being pulled off left a raised lump where the mouth was attached. It was also white where the mouth had been. I have preserved some of the parasites in methylated spirits. Could you say what these parasites are? Should I have slung the cow? Ought I to have left her without feed when she was not chewing her cud? What is a good drench to start a cow chewing her cud?

The Live-stock and Meat Division :—

The cow evidently injured either her spine or the muscles of the back while struggling. She may also have had some other disease which accounted for her low condition. Her failure to chew her cud was probably on account of the injury. There is no drench you can give to make a cow chew her cud. Suspension of rumination is a symptom of disease, the act returning as the cow gets better. The amount of food she would eat while not chewing her cud would be so small as to be of no account. If rumination ceases, the apetite is impaired also. The parasite you found is a trematode worm known as *Amphistomum conicum*. They are not uncommon, and are generally looked upon as being harmless.

COW AFFECTED WITH DISEASE.

R. G. C. MARSHALL, Northern Wairoa :—

I had a valuable cow in milk one week when she got milk-fever. She was fat when she calved, but on getting fever she dropped to a skeleton. I fed her on green oats and pasture. I might say that she got down and had to be pumped up twice. She is still alive, and I had to let her calf go with her, as I had no milk to feed it. The cow barely gives enough for the calf. Will she be all right, and what would be the best to do to get condition on her ?

The Live-stock and Meat Division :—

I note you consider the cow had milk-fever, and her present condition is the result. As the cow had been in milk for a week before being affected, it is doubtful if the disease was the so-called milk-fever. It is very rare for a cow to become affected after the third day. It should not be concluded that because an animal goes down that she has milk-fever. There are several other diseases which occur in newly calved cows where this takes place, but you do not get the loss of consciousness, blindness, &c., seen in the true disease. The disease from which your cow suffered was most probably septic metritis. This is a form of blood-poisoning due in most cases to retention of parts of the afterbirth, their putrefaction and the absorption of the toxins or poisonous substances into the system. If treatment is not adopted the animal usually dies or lingers on like your cow has done. Frequent irrigation of the womb with warm antiseptic solutions such as lysol, Jeyes' fluid, kerol, &c., with the administration of stimulants, is the best treatment. We could not give an opinion as to the cow recovering, as you do not say how long it is since she calved. It is doubtful, however, whether she will get through the winter; there would be much better chance for her if spring were here. All you can do is to give her good food and attention. You might try the following drenches: Dried sulphate of iron, 2 oz.; powdered nux vomica, 1½ oz.; sulphate of magnesia, 10 oz.; powdered ginger and powdered gentian, of each 3 oz. This should be divided into six drenches, and one given every day in a good quart of oatmeal gruel.

TROUBLE WITH HORSE.

WALTER JOWITT, Auckland :—

I recently bought a horse which was very low in condition. Since bringing him home I have fed and cared for him well. When I had been feeding him about a fortnight I noticed he began to stagger in his walk, as if he was half-drunk. Can you enlighten me as to the cause, also the cure, if any ?

The Live-stock and Meat Division :—

From the information you furnish it is impossible to say what is the matter with the horse. The interference in his gait would seem to point to some nervous trouble being the cause. Brain or spinal diseases in horses are seldom curable, so it is no good your spending money on food and attention on the animal if this is the case. The best plan would be to get a qualified veterinary surgeon to see him, and act on his advice.

MOTOR FOR AGRICULTURAL PURPOSES.

M. M. C., Gisborne :—

In the April issues of the *Journal* for 1913 and 1914 references were made to the use of the agrimotor. I would be glad to hear of any further information you have in relation to them, their initial cost, cost of working, weight, &c. If there are any in use in New Zealand perhaps you could obtain the results of the experience of the users. One that would plough about 3 to 4 acres per day, if not too heavy, would be of most general use.

The Fields and Experimental Farms Division :—

As far as I know there are no agrimotors in use in New Zealand. Messrs. John Fowler and Co., Leeds, are the manufacturers of the Wyles agrimotor. The New Zealand agents are Messrs. William Wood and Co., Christchurch. This firm will probably be able to supply you with all the information you require.

WHEAT-GROWING.—SHED FOR LUCERNE HAY.

"INQUIRER," Awahuri :—

1. Could you inform me the cost per acre to sow wheat, inclusive of labour-cost, and also cost of reaping and threshing ?

2. I have about 6 acres of lucerne. I should like to get a hay-shed built, with a roof capable of being raised and lowered. Could you give me any idea of what a shed like this would cost ? My idea is to put the first cut in the shed and lower the roof on it, then when the second cut is ready raise the roof and put it in, lowering the roof on it afterwards, and so on with the various cuts.

The Fields and Experimental Farms Division :—

1. The following should constitute a fair estimate of the cost per acre of growing wheat: Skim-ploughing, 5s.; harrowing, 1s.; deep ploughing, 6s. 9d.; disking (twice), 3s.; harrowing, 1s.; rolling, 1s.; drilling, 1s. 9d.; harrowing, 1s.; rolling, 1s.; light harrowing, 1s.; manure, 7s. 6d.; seed, at 7s. per bushel, 14s.; reaping, 3s. 9d.; twine, 2s.; stooking and stacking, 7s.; threshing at 3d. on 45-bushels crop, 11s. 3d.; bags at 1d. (net cost), 1s.: total, £3 9s. per acre.

2. We have no information as to erection and cost of a shed with lifting roof for hay. There are none in this country to our knowledge. The following description of the construction of a stack-cover should, however, assist you: "Stack-covers are used to protect stacks from rain whilst in the course of construction. The essential part of a cover is a big sheet, which may be used with or without pole supports. It is preferable not only for the efficiency of the covering but for the preservation of the cover, that it be carried on poles. For this purpose two poles or masts are set up, one at either end of the stack, previous to commencing building. The poles should be firmly let into the ground, and must then be effectively stayed by guy-ropes. A swinging beam is laid between the poles, and the cloth (or tarpaulin) is suspended over it. The beam is secured at either end by ropes, which pass over pulleys, which allow the beam and cloth to be raised and lowered at will. A rick-cover should be rather larger than the stack it has to protect, and should be kept free from holes." This arrangement should prove less costly and more easily handled than the lifting roof. The cover could be made of tarpaulin, similar to that used on railway-trucks. The stack could be so built as to expose as little as possible of it to the weather quarter.

DEHORNING MILKING-COWS.

"INQUIRER," Korito :—

When is the best time to dehorn milking-cows ? Is there any preparation that can be used beneficially to assist the healing process ?

The Live-stock and Meat Division :—

With regard to the dehorning of cattle, it does not matter when this operation is carried out, but it is preferable to perform it during cold weather or when flies are not in evidence. As regards subsequent applications to the parts, the best plan is to thoroughly wash with some mild disinfectant, such as a weak solution of Jeyes' fluid. Many farmers are in the habit of applying Stockholm tar to the stump. This not only possesses antiseptic properties, but also tends to prevent undue bleeding.

TANNING HIDES.

C. B., Kaipara :—

Will you please inform me if there is any practical way in which a farmer can tan a calf or cow hide, and also remove the hair from same ? I believe there is a powder obtainable in America which is claimed to tan hides into leather in from a day to a day and a half. Will you give me an opinion on same ? I think black-wattle bark is obtainable in this district in small quantities if it is necessary to use it.

The Live-stock and Meat Division :—

Tanning is a long and highly technical process, and we do not know of any practical way in which a farmer can tan a hide.

WORMS IN HORSES.

F. BLUMHARDT, Pakaraka :—

I have a draught mare troubled with worms, but I am not quite sure if it is *Ascaris vermicularis* or *Strongylus armitus*. The worm is about 2 in. to 3 in. long, and of a milky-white colour. The body looks like two different parts, one half about as thick as a match and the second just like thread. The mare never passes worms in her dung, only at times one or two appear. Very often the mare kicks the ground with her hind legs: that must be when the worms are troubling her. Could you inform me how to treat the mare?

The Live-stock and Meat Division :—

The worms described are those known as *Oxyurus curvula*. These are considered to be harmless, although their presence may at times cause a certain amount of irritation. Treatment consists of salt-and-water or vinegar-and-water injections given per rectum. One ounce of turpentine administered mixed with a pint of linseed-oil will also assist in expelling the worms.

BOOK ON SHEEP.

"CANTERBURY," Southland :—

I would be much obliged if in your next issue you could advise me of a cheap and concise work on sheep, points in picking rams, classing wool, telling ages from teeth, &c.

The Live-stock and Meat Division :—

Probably the best book for your purpose would be one entitled "Sheep: Breeds and Management," by John Wrightson, price 3s. 6d. This is one of the Live-stock Handbooks Series, published by Vinton and Co., 9 New Bridge Street, London E.C. The work deals with the management of sheep under conditions prevailing in Great Britain, but no doubt a great deal of the information would be equally applicable to the management of sheep, &c., in this country.

AILMENT OF HORSE.

G. H. BRADLEY, Arapohue :—

I had a medium-draught horse, ten years old, which was always looking out of sorts for the last six months. I had him treated for worms in different ways: after fasting for thirty-six hours, one thing was two bottles of new milk with two egg-cups of turpentine added. The horse got weaker all the time, also very stiff in walking about. At last one morning he was down, and I could see that he was done for ever, so in the evening I had him shot. Next day several farmers of some experience, who had been much interested in this case, came along to see the horse opened up. We found the heart to be extra large, and inside was about one-quarter of a pound of jelly-fat in each compartment. In the first stomach the lining was about half eaten away, with a few bots about half-grown, and in the other bowels he was full of worms in millions, but of no size. There were no large worms to be seen. Do you think the heart had been strained in any way with pulling too much? Would the milk and turpentine have eaten away the lining of the stomach? What is the best treatment for small worms such as I have mentioned?

The Live-stock and Meat Division :—

We do not think that heart-strain from overwork could have been the direct cause of death. The very large numbers of parasitic worms may have set up a condition of anæmia combined with general debility and weakness as a result of their presence. In such cases the heart may appear enlarged, flabby, and with thin walls, while blood serum accumulated in the cavities will give the appearance of the "jelly-fat" referred to. The stomach was in all probability quite normal. The peculiar division into a smooth white surface of the inside lining and a darker or villous portion is the natural appearance of any healthy horse's stomach. The dose of milk and turpentine had nothing to do with this, neither had the bots. In regard to treatment for worms, many remedies have been suggested, some of which

occasionally give satisfactory results. There is, however, nothing like nutritious food for combating this trouble. Crushed oats, boiled linseed, and good clover hay, when grass is short on the paddocks, are all excellent, and should always accompany any medicinal treatment which may be tried. The following prescription for worm-powders may be of use to you: Potassium antimony tartrate, 1½ oz.; sulphate of iron (powdered), 1½ oz.; gentian-powder, 2 oz.; aniseed, 2 oz. Divide into twelve powders. Give one twice daily in the food, which may be slightly damped. When all have been taken administer a 6-dram physic ball.

WHEY BUTTER.

D. BLACKADDER, Maruia, Reefton :—

Have you any leaflets describing the process of making whey butter, how to prepare it for market, where it can be sold, and probable price to be obtained for it or any information likely to be of use ?

The Dairy-produce Division :—

As there is very little difference between the making of whey butter and the ordinary butter from cream, it has not been found necessary to prepare any leaflet dealing with the subject. In factory practice the whey is skimmed in the same way as whole milk, and the cream recovered is then pasteurized after being diluted with about 5 per cent. of whole milk. From the pasteurizer the cream is immediately cooled down to ripening-temperature, and about 2 per cent. of starter used for that purpose. When churning this whey cream it is advisable to keep the temperature a little lower than is the case with the cream from whole milk, as the melting-point of the fat recovered from the whey seems to be lower. No delay should occur in separating the whey immediately after it has run from the cheese-vat. If the process is deferred for a time it has a bad effect on the flavour of the butter. It may be pointed out that the manufacture of whey butter on a small scale, such as would obtain at a private dairy, is not recommended, as it would not pay for the trouble and expense incurred.

AILMENT OF HORSE.

J. FULTON, Silverhope, Whangarata :—

Would you inform me of a cure for an angleberry on a horse's foot ? I have a mare, and this huge cornlike growth started from a tramp just above the hoof. I have applied caustic, but without results.

The Live-stock and Meat Division :—

It would have been much better if you had sent a rough sketch showing the position, and also given some definite idea as to the size of the growth. Removal with the knife appears to be the only thing to do. Whether there would be any danger in operating I could not say. If you send a sketch I may possibly be able to tell you. In such cases it is always best to get a qualified veterinary surgeon to operate if the services of one can be obtained.

FORAGE FOR BREEDING-EWES.

"SOILING," Otautau :—

I have a paddock of some 20 acres which I intend to plough twice and sow a soiling-crop of some sort to lamb ewes on. I think Dun oats (these are available) and tares or vetches would suit. I would like you to advise on the subject *re* quantities, sowing, &c. The ewes will lamb the first week in September. As a rule we are not too flush in grass here then. How would 1 cwt. per acre of grain-manure suit the crop ?

The Fields and Experimental Farms Division :—

Dun oats and vetches would be suitable for early spring feed for ewes at lambing. You could sow during the present month (June) 1½ to 2 bushes of oats, and 1 bushel of Black Scotch winter vetch, or of Hairy or Winter vetch. As a

substitute for Dun oats you will find Emerald rye-corn (1½ bushels) of considerable value for winter and spring feed. Work up the soil well so as to provide a fine seed-bed, and roll previous to seeding. Disking in the oats and harrowing in the vetches would make the best form of seeding, on account of the difference in size of seed, but drilling in the seedings might be accomplished with a suitable drill. A drill that will sow the vetches before the coulter-stroke, by means of a grass-seeding attachment, is preferable. You have not provided a description of your soil, but for average soil-conditions 1½ cwt. to 2 cwt. basic superphosphate and 1 cwt. blood-and-bone manure would be suitable manuring for this mixture. If the land has been manured the previous season for a root crop, reduce the above manuring by one-third.

SEED POTATOES.

"SUBSCRIBER," Marton :—

Will you please inform me what size or weight is considered the best for a seed potato? What is the minimum size advised?

The Fields and Experimental Farms Division :—

Extended experiments in Canada reveal the fact that the highest yields are obtained from medium to large whole seed potatoes. The medium size advised is what might be described as small to medium, whole.

APPLE VARIETIES.

E. J. E. STRINGER, Te Kauwhata :—

You advise "Reinette" that the better standard varieties are better than the apple Reinette du Canada. Can you tell me what is a good variety to plant in this district—blight-proof, late, good cropper and good keeper, and highly coloured? I have Gravensteins, Willie Sharp, Sharp's Late Red, and Summer Golden Pearmain, also six Jonathans. The first two are doing well. Sharp's Late Red are just starting to bear, and Summer Golden Pearmain not at all well.

The Orchards, Gardens, and Apiaries Division :—

As you mention nothing in reference to quality, the Apple of Commerce should meet your requirements. In preference, however, if late enough for you, I would advise you to plant Delicious or William Anderson.

FRUITGROWING.

G. B. ROGERS, Wairere :—

I am thinking of planting out a new orchard on a piece of flat land about an acre in extent. I intend planting about 108 trees. The land is fair second-class. What sort would you advise for commercial purposes, dividing them into three classes—early, midsummer, and late varieties, and also blight-proof varieties?

I have an acre of pear-trees, five years old, commencing to bear. What kind of manure would you advise me to use? The trees are making good growth now. The land is growing clover at present, which I cut for hay this summer. I intend ploughing the land again soon.

The Orchards, Gardens, and Apiaries Division :—

I would recommend the following varieties of fruit-trees (blight-proof): Early—Irish Peach; medium early—Gravenstein; mid-season—Mona Hay or Willie Sharp; medium late—Lord Wolseley or Delicious; late—William Anderson or Commerce. The selection of blight-proof varieties for all seasons cuts out many of the popular commercial varieties now being planted.

It may be advisable to dress the soil round your pear-trees with lime in the autumn, following this in the early spring with a fertilizer composed of 1 part sulphate of potash to 2 of superphosphate. Apply at the rate of 3 lb. to 4 lb. per tree.

LONDON MARKET VALUES.

COMPARATIVE STATEMENT COMPILED FROM THE HIGH COMMISSIONER'S CABLES FOR THE PAST THREE MONTHS.

London Date.	Wool. Bradford Quotations for Tops. 36's.	40's.	44's.	50's.	56's.	60's.	Mutton. Canterbury.	Lamb. North Island.	Lamb. Canterbury.	Beef. Other than Canterbury.	Beef. New Zealand Hinds.	Beef. New Zealand Fores.	Butter. Danish.	Butter. New Zealand.	Cheese. New Zealand White.	Cheese. New Zealand Coloured.	Cheese. Canadian.	Hemp (Spot). New Zealand Good-fair.	Hemp (Spot). New Zealand Fair.	Hemp (Spot). Manila Fair Current.	Hemp (Forward Shipment). New Zealand Good-fair.	Hemp (Forward Shipment). New Zealand Fair.	Hemp (Forward Shipment). Manila Fair Current.	Wheat. Short-berried.	Wheat. Long-berried.	Oats. Sparrowbills.	Oats. Danish.
1915.							d.	d.	d.	d.	d.	d.															
March 6	..	..	..	..	..	..	..	5 15/16	..	7 1/2	6 7/16	6 1/2	140/0	136/0	92/0	92/0	94/0	31/0/0	29/0/0	35/0/0	..	..	..	..	..	..	..
,, 13	..	..	..	..	..	..	..	6	..	7 3/8	6 1/2	6 1/2	148/0	140/0	94/0	94/0	96/0	32/0/0	30/0/0	36/10/0	..	..	..	..	..	..	..
,, 20	..	..	..	..	..	..	..	6	..	7 7/16	6 1/2	6	148/0	143/0	94/0	94/0	96/0	33/0/0	31/0/0	37/10/0	33/15/0	31/15/0	39/0/0	..	..	..	..
,, 27	..	..	..	..	..	..	..	6	..	7 7/16	6 1/2	6	143/0	138/0	94/0	94/0	96/0	34/10/0	32/10/0	40/0/0	35/0/0	33/0/0	40/10/0	..	..	..	..
April 1	..	..	..	..	..	..	..	6 1/4	..	8	6 1/2	6	142/0	136/0	94/0	94/0	98/0	35/0/0	33/0/0	40/10/0	34/10/0	32/10/0	40/0/0	..	..	..	..
,, 10	..	..	..	..	..	..	..	6 1/2	8 1/2	8	6 5/8	6	142/0	136/0	94/0	93/0	98/0	34/10/0	32/10/0	40/0/0	34/0/0	32/0/0	39/10/0	..	..	..	..
,, 17	..	..	..	..	..	..	..	6	8 1/4	8	6 1/2	6 1/8	144/0	135/0	94/0	93/0	98/0	33/10/0	31/10/0	39/0/0	32/15/0	31/0/0	38/10/0	..	..	..	..
,, 24	..	..	..	..	..	..	6 1/4	6 3/16	8	7 7/8	6 5/8	6 1/8	144/0	134/0	94/0	93/0	98/0	32/10/0	30/10/0	38/0/0	31/10/0	29/10/0	36/10/0	..	..	..	..
May 1	..	..	..	..	..	..	6 1/4	6 3/16	7 7/8	..	6 5/8	6 1/4	146/0	136/0	94/0	94/0	98/0	32/10/0	30/10/0	39/0/0	31/10/0	30/0/0	..	..	..	..	..
,, 8	..	..	..	..	..	..	6 1/4	6 3/16	7 7/8	7 7/8	6 5/8	6 1/4	154/0	140/0	94/0	94/0	98/0	33/0/0	31/0/0	39/10/0	32/10/0	30/10/0	..	..	..	..	..
,, 15	..	..	..	..	..	..	6 1/4	6 3/16	7 13/16	..	..	..	156/0	144/0	95/0	94/0	98/0	32/10/0	30/10/0	39/0/0	32/0/0	30/0/0	38/0/0	..	..	..	..
,, 22	..	..	..	..	..	..	6 3/4	6 5/8	8	7 7/8	7 1/4	6 1/2	156/0	146/0	94/0	94/0	98/0	33/0/0	31/0/0	39/10/0	32/10/0	30/10/0	39/0/0	..	..	..	..
,, 29	..	..	..	..	..	..	6 1/4	6 5/8	8 1/4	8 1/8	..	..	150/0	144/0	100/0	100/0	..	32/10/0	30/10/0	39/0/0	32/0/0	30/0/0	38/10/0	..	..	..	..
June 5	..	..	..	..	..	..	7	..	8 3/4	8 1/8	8	6 1/2	148/0	142/0	100/0	100/0	98/0	32/10/0	30/0/0	39/0/0	32/0/0	29/10/0	39/0/0	..	..	..	..

THE DOMINION'S EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales.	Kauri-gum, Cases.
January,	1915	137,816	296,439	45,622	339	138,081	85,123	87,393	..	..	2,860	683	..	1,209
,,	*1914*	*231,766*	*464,185*	*30,424*	*33*	*150,492*	*136,086*	*108,742*	..	*500*	*2,851*	*15,234*	*4,306*	*11,133*
February,	1915	433,585	517,581	77,421	311	119,371	96,090	159,347	..	..	..	13,111	6,619	2,763
,,	*1914*	*354,190*	*334,207*	*14,100*	*3*	*86,570*	*59,532*	*127,372*	..	*4*	..	*3,709*	*633*	*7,607*
March,	1915	80,439	203,480	30,176	..	55,280	51,811	49,809	..	..	..	8,410	185	274
,,	*1914*	*446,522*	*551,313*	*36,689*	..	*61,060*	*62,732*	*95,175*	..	..	..	*8,187*	*2,562*	*3,958*
April,	1915	286,155	328,779	45,340	..	6,703	38,561	41,371	..	..	1,011	9,328	1,474	3,461
,,	*1914*	*234,765*	*366,786*	*22,185*	..	*7,822*	*63,796*	*58,488*	..	*2,901*	..	*1,247*	*888*	*5,909*
May,	1915	257,953	433,831	34,780	655	148	17,065	21,615	..	..	2,923	4,968	808	2,636
,,	*1914*	*336,632*	*638,397*	*39,315*	*54*	*837*	*37,776*	*43,364*	*3,623*	*11,062*	..	*8,355*	*2,112*	*9,316*
June,	1914	261,877	634,981	36,400	..	1,153	19,247	18,774	..	28,141	1,000	7,924	4,258	7,881
,,	*1913*	*315,034*	*528,815*	*24,444*	*588*	*79*	*3,166*	*18,741*	..	..	*13,072*	*13,592*	*4,065*	*5,439*
July,	1914	225,411	239,143	38,170	..	1,355	2,003	15,868	..	1,425	1,900	5,810	2,584	8,053
,,	*1913*	*215,713*	*331,353*	*14,030*	..	..	*1,687*	*17,169*	*5,651*	*300*	*9,190*	*9,682*	*1,720*	*10,793*
August,	1914	4,251	63,111	19,094	516	1,979	50	4,845	600	38,220	10,403	367	245	3,705
,,	*1913*	*161,593*	*178,263*	*13,129*	*6*	*8*	*407*	*8,494*	*11,604*	*45*	*38,480*	*3,714*	*2,310*	*6,406*
September,	1914	3,386	49,200	2,353	..	15,885	..	3,337	..	5,896	7,288	1,143	57	..
,,	*1913*	*133,122*	*83,521*	*5,334*	*16*	*6,575*	*2,020*	*7,176*	..	..	*16,336*	*3,826*	*1,501*	*10,049*
October,	1914	291,432	128,016	49,104	..	81,842	30,487	8,938	..	68,660	38,121	2,042	1,650	1,683
,,	*1913*	*14,122*	*25,735*	*580*	..	*42,847*	*21,452*	*2,705*	..	..	*10,020*	*6,986*	*3,672*	*2,923*
November,	1914	136,346	27,577	48,302	27	98,729	70,048	37,604	15	24,289	35,783	885	110	1,377
,,	*1913*	*20*	*1,479*	..	..	*53,468*	*23,722*	*1,891*	..	..	*2,478*	*4,162*	*771*	*2,314*
December,	1914	192,952	149,835	44,876	..	172,990	80,114	86,317	..	..	9,306	1,136	116	2,157
,,	*1913*	*128,087*	*86,890*	*8,909*	..	*249,526*	*124,821*	*51,385*	..	*250*	*24,479*	*19,807*	*5,276*	*11,273*

HEMP AND TOW GRADING RETURNS.

MAY.

Hemp.—The total number of bales graded was 9,463, as compared with 8,891 for the corresponding month of last year, an increase of 572 bales. For the twelve months ending 31st May, 1915, the number of bales graded was 83,051, as compared with 143,556 for the previous twelve months, a decrease of 60,505 bales.

Tow.—During the month 2,535 bales were dealt with, as compared with 3,257 for the corresponding month of last year, a decrease of 722 bales. For the twelve months ending 31st May, 1915, the number of bales graded was 22,616, as compared with 46,888 for the previous twelve months, a decrease of 24,272 bales.

Stripper-slips.—During the month the number of bales graded was 99, as compared with 79 for the corresponding month of last year, an increase of 20 bales. For the twelve months ending 31st May, 1915, the number of bales graded was 1,403.

HEMP, TOW, AND STRIPPER-SLIPS GRADED THROUGHOUT THE DOMINION DURING THE MONTH OF MAY, 1915.

Hemp.

Port.	Superior.	Fine.	Good-fair.	Fair.		mmon.	Rejected.	Con-demned.	Total.
				High Point.	Low Point.				
	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	..	262	903	400	17	6	..	1,588
Foxton ..	..	..	1,135	1,756	482	47	30	..	3,450
Napier ..	..	..	..	..	..	..	..	..	..
Wellington ..	..	103	884	1,779	334	79	40	1	3,220
Blenheim ..	..	67	84	..	14	..	..	..	165
Picton ..	..	72	77	12	..	..	..	..	161
Lyttelton ..	..	..	10	..	..	..	..	..	10
Dunedin ..	..	..	139	61	..	1	..	..	201
Bluff	..	4	203	344	117	..	..	..	668
Totals ..	..	246	2,794	4,855	1,347	144	76	1	9,463
Percentages of totals	..	2·60	29·52	51·31	14·23	1·52	0·81	0·01	..

Tow.

Port.	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	6	196	333	37	572
Foxton ..	184	485	69	..	738
Napier	..	..	..	..	..
Wellington ..	210	377	48	9	644
Blenheim ..	39	106	8	..	153
Picton	..	93	..	..	93
Lyttelton ..	..	..	..	..	..
Dunedin ..	7	29	39	..	75
Bluff	41	14	136	69	260
Totals ..	487	1,300	633	115	2,535

Stripper-slips.—Foxton: Second grade, 99.

NEW ZEALAND-SAN FRANCISCO TRADE.

FOLLOWING are the shipments of produce for San Francisco Tahiti, and Rarotonga, and transhipments for Vancouver from New Zealand, since January last:—

—	"Maitai," 4th Feb.	"Moana," 4th March.	"Marama," 1st April.	"Maitai," 30th April.	"Moana," 28th May.
Gum, packages	30	31	13	49	16
Milk, cases	1,000	..	9	..	..
Grain, sacks	10	30	34	47	10
Meat, cases	..	..	61	55	60
Onions, cases	11	..	36	17	14
Potatoes, sacks	30	..	42	32	16
Sundries, packages	435	4	17	498	41
Butter, boxes	..	7	9	2	5
Hemp, bales	..	..	..	..	259
Frozen lamb, carcases	..	3	..	3	3
Hides and skins, sacks and bales	2	..	..	..	..
Beef, quarters—pieces	..	7	8	..	..
Veal, carcases	..	200	..	..	..
Cheese, crates	..	..	9	..	..
Sheep-skins, bales	15	..	16		..

NEW ZEALAND-VANCOUVER TRADE.

FOLLOWING are the shipments of produce for Vancouver and North American ports from New Zealand since December last:—

—	"Niagara," 26th Jan.	"Makura," 22nd Feb.	"Niagara," 26th March.	"Makura," 20th April.	"Niagara," 18th May.
Butter, boxes	9,159	8,175	9,030	4,875	..
Mutton, carcases	1,041	78	..	..	..
Lamb, "	444	175	..	..	..
Beef, quarters—pieces	247	221	..	..	..
Veal, carcases	10	23	..	..	..
Frozen sundries, packages	17	22	..	..	..
Wool, bales	109	210	1,198	531	431
Grass-seeds, beans, &c., sacks	22	..	..	261	..
Hides and skins, sacks, &c.	1,368	1,277	996	702	1,473
Onions, cases	60	1,333	2,000	200	..
Sheep-skins, bales	230	136	96	186	134
Jam, cases	..	..	..	..	..
Sundries, packages	210	..	22	36	17
Pelts, casks	45	83	40	30	..
Kauri-gum, packages	..	..	53	360	1,180
Hemp, bales	340	264	250	97	327
Rabbits, crates	..	..	..	..	..
Timber, pieces	..	..	..	..	..
Eggs, cases and crates	..	..	..	..	..
Meats (canned, &c.), cases	..	..	..	..	..
Cheese, crates	..	..	..	..	..
Fresh fruit, cases	..	..	985	1,610	..

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of May, 1915 :—

Port of Shipment.	Horses			Cattle.		Sheep.			Pigs.		Dogs.		
	To Australia.	To Eastern Pacific.	To Montevideo.	To Australia.	To Eastern Pacific.	To Australia.	To Eastern Pacific.	To South America.	To Australia.	To Eastern Pacific.	To Australia.	To Eastern Pacific.	To United Kingdom.
Auckland ..	2	16	..	..	41	..	407	..	..	60	..	..	..
Gisborne ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Napier ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wellington ..	2	..	..	..	..	42	..	..	..	..	..	..	..
Lyttelton ..	3	..	..	..	..	5	..	..	..	..	..	..	..
Dunedin ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bluff ..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals ..	7	16	..	..	41	47	407	..	..	60	..	..	..

Particulars of horses shipped: Medium draughts, 11; thoroughbreds, 5 geldings; light horses, 1 mare, 1 filly, 1 gelding; ponies, 2; mules, 2.

Auckland also exported 23 crates of poultry to eastern Pacific.

STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of May, 1915 :—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
	MOTUIHI ISLAND (AUCKLAND).				
	Nil.				
	SOMES ISLAND, WELLINGTON.				
1	Fox-hound ..	Male ..	London ..	D. Riddiford ..	Wellington.
1	Fox-terrier ..	,, ..	,, ..	Mr. Sinclair ..	Wanganui.
1	Brown stallion	,, ..	San Francisco	C. D. Hudson ..	Dunedin.
	QUAIL ISLAND, LYTTELTON.				
	Nil.				

AGRICULTURAL SHOW DATES.

South Taranaki Winter Show.—Hawera, 30th June, 1st, 2nd, and 3rd July, 1915.
Hawke's Bay A. and P. Society.—Hastings, 20th and 21st October, 1915.

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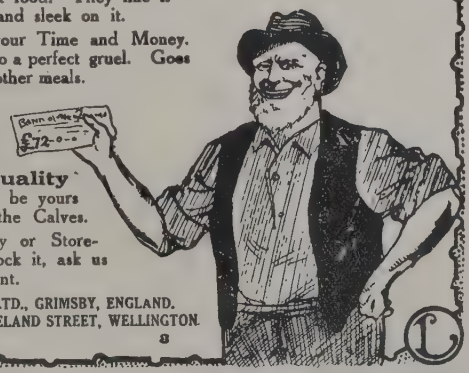

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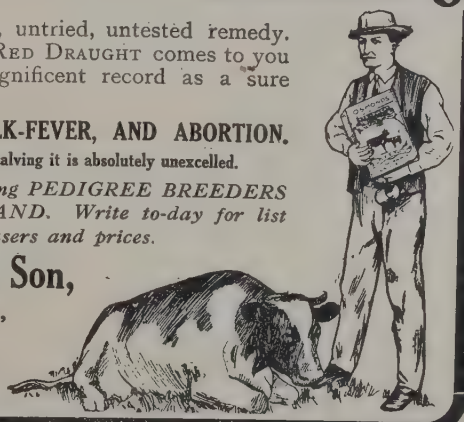

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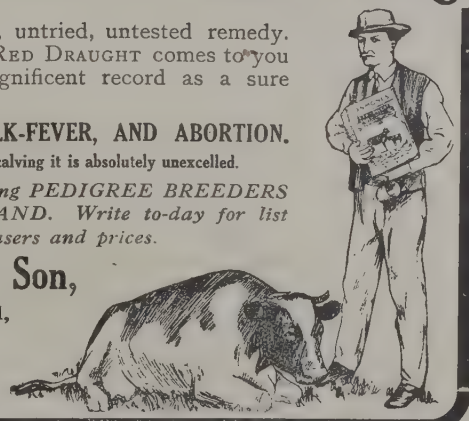

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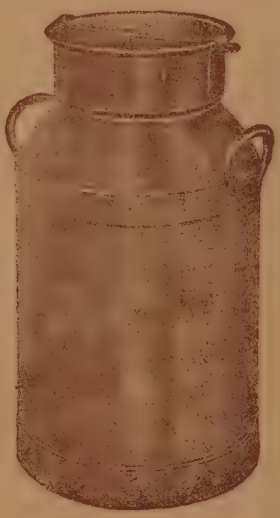

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